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General Articles

THE INFLUENCE OF OLD STRAINS OF *BR. ABORTUS* UPON PREGNANT HEIFERS

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I. Introduction

Shortly after the Departmental Committee appointed in 1905 by the Board of Agriculture and Fisheries to inquire into Epizootic Abortion issued their First Report, in 1909, it was decided by the Veterinary Branch of the Department of Agriculture and Technical Instruction for Ireland to test the value of vaccination with living culture of *Br. abortus* on non-pregnant cows and heifers on the lines indicated in the Committee's Report.

With this object in view several strains of the organism were obtained from the Committee through the courtesy of Mr. Stewart Stockman (afterwards Sir Stewart Stockman) in the year 1910. In all, five strains (171, 172, 212, 122 and "King") were received, and have been kept going on artificial media in our laboratory since that date, chiefly for the preparation of living vaccine for issue to veterinary surgeons in Ireland. All strains grew satisfactorily on 2 per cent. glucose agar slopes. The vaccine was prepared by inoculating seed material from agar slopes into flasks containing 500 c.c. glucose broth and incubating for a month or longer until a rich growth appeared. The dose recommended in the early years of the work was 150 c.c. subcutaneously; in 1920, however, the dose was reduced to 50 c.c., without, as far as could be ascertained from field reports, any adverse effect on results, but with the advantage that the animals withstood the immediate reaction of vaccination much better.

For a number of years the vaccine was issued free of charge to veterinary practitioners for use in infected herds provided they undertook to supply the Department with results. This arrangement, however, was not satisfactory for a variety of reasons, and little reliable information on the value of the vaccine was obtained.

Three veterinary workers have recorded their experience with the vaccine.

Professors Craig and Kehoe,[1] of the Veterinary College, Dublin, in reporting results of vaccination in an infected dairy herd in County Dublin stated: "Although no control non-vaccinated animals were available to compare with the animals subjected to vaccination, it does appear to be of important significance that from May, 1920 to March, 1922, no abortions occurred in the herd after vaccination. Only three cows, (Nos. 5, 6 and 18) aborted after vaccination. We realise, of course, that in any outbreak of contagious abortion the number of abortions is greatly decreased in subsequent years, and that an animal only occasionally aborts more than once. Nevertheless, from the above facts there appears to be very little doubt that in this particular outbreak a very marked degree of immunity was produced by the use of anti-abortion vaccine, and the breeding qualities of the herd were vastly improved thereby." These authors further stated: "It has been suggested by other observers that in using as a vaccine against the disease a living culture of the *Bacillus abortus* one is confronted with a very serious danger of infecting the animals with the disease and thus creating 'carriers.' The observations we have made in the case of this herd do not, however, bear out that suggestion. It would appear to be highly probable that any 'carriers' which do come into existence after vaccination are produced by the more virulent strains of organisms which are present in the cases of natural infection in the herd and not by the organisms contained in the vaccine. The organisms in the vaccine are liable to have been attenuated by the repeated sub-cultivation on an artificial medium and some evidence on that point has been brought forward by practitioners who have inadvertently injected the vaccine into pregnant animals without inducing abortion." The vaccine supplied to Professors Craig and Kehoe for use in this herd was prepared from the strains of *Br. abortus* referred to above and at the time of issue had been cultivated on artificial media for a period of not less than ten years.

The late Mr. J. F. Healy,[2] Midleton, County Cork, vaccinated a number of cows under a scheme set up by the Governors of the Munster Dairy School, County Cork, to test the value of anti-abortion vaccine as a preventive. It appears that during the years 1916 to 1918, inclusive, 613 cows were dealt with and of these 8·8 per cent. aborted following vaccination. Prior to vaccination the percentage of abortions in the herds was apparently exceptionally high—over 60 per cent.

Returns furnished to the Department by veterinary practitioners relating to 4,894 animals vaccinated during the years 1923-1926, show that prior to vaccination the incidence of abortion in the herds in question was 37·8 per cent. and sterility 8·8 per cent., and that following vaccination 7·3 per cent. of the animals aborted and 4·5 per cent. were barren. Few, if any, controls were kept in these herds, and it is not contended that the returns, which were not checked by visits to the farms, prove that the vaccine alone was responsible for the reduction in abortions; they are chiefly of interest from the view point of the average stock owner, who is inclined to assess values on the apparent results

following vaccination—an aspect which must, after all, be taken into account by the practitioner.

Since 1927 the vaccine has been issued to veterinary surgeons in the Free State at a charge of one shilling per dose, its use being recommended only on non-pregnant cows and heifers in badly infected herds. Returns as to results are not now asked for, but it is known that the vaccine is used fairly extensively in dairying districts year after year.

So far as it is possible to ascertain the value of the vaccine from field experience, it might be broadly stated that while vaccination apparently fails on occasions to give protection, the general results indicate that usually a serviceable measure of protection or immunity is conferred. Here the matter must rest, as it is not intended to go further into the details of available experimental proof as to the value of vaccination to the stockowner or its possible danger to public health; the object of this paper being to record results which may follow from the maladministration of living vaccine on pregnant cows and heifers. Statements have been made that occasionally cows and heifers in early pregnancy had been inoculated in error with large doses of living vaccine with no apparent ill effect, and as a consequence there was a danger that living vaccine, especially vaccine prepared from old strains of *Br. abortus*, might be regarded by some practitioners as harmless for pregnant cows and heifers. It was to acquire, if possible, more definite information on this point that the following experiments were undertaken.

II. Experimental Observations

The animals used in the experiments were ten Kerry heifers, Nos. 8 to 17 inclusive, aged two to three years. The animals came from a herd in which there was no history of contagious abortion, and blood samples taken from the animals before purchase were negative to the agglutination test in dilutions of 1 in 25 or higher. Some of the heifers were a few weeks pregnant when purchased; the remainder were mated after arrival at the laboratory. The strains of the organism used for the preparation of vaccine were those obtained from the Abortion Committee and had been growing in glucose agar or in glucose broth since 1910 in our laboratory—a period of over 15 years. Prior to their use in these experiments all the strains failed to produce lesions (other than an occasional enlarged spleen) in guinea pigs when inoculated intraperitoneally in large doses, while the blood of most of the test animals gave complete positive reactions to the agglutination test in dilutions up to 1 in 100.

The plan of the experiments was to inoculate subcutaneously each of the experimental heifers with live vaccine prepared from one of the five strains of *Br. abortus* in different doses, at various stages of pregnancy, and to note the effects on the course of the pregnancies, the fœtal membranes, the blood titres, the incidence of udder infections, and also what ill effects, if any, the vaccinations would have on the fertility of the animals and on the course of their second pregnancies. It was decided to use large doses of vaccine as the virulence of the strains was rather doubtful for bovines, and it was thought that small doses might give inconclusive results. The blood and milk of each animal were submitted to the agglutination test for contagious abortion at approximately monthly intervals during the course of the experiments.

The inoculations were given under the loose skin on the chest wall behind the elbow; a hard somewhat painful oval swelling, varying in size from two to six inches or more in diameter, developed at the site of inoculation, and persisted for a week or ten days; the animals showed a temperature reaction ranging from 104°F. to 106°F., beginning on the second or third day after vaccination, and continuing for three or four days; the general health of any of the animals was not affected. During the course of the experiments the heifers were at pasture and were removed to a loose box at the approach of parturition. They were not accustomed to tieing and as it was not possible to provide a night attendant, the placentæ of some of the animals which calved during the night were eaten by the cows. In these instances the placentæ were expelled shortly after calving. It has subsequently been found that the application of a well-ventilated leather muzzle in such circumstances prevents ingestion of the afterbirth and does not inconvenience the animal.

A brief record of the important features occurring in each animal during the course of the experiments is given below. Fuller details will be found in the Tables 1 and 2 and Charts 1 to 10.

Heifer No. 8

This animal was inoculated subcutaneously with 50 c.c. rich broth culture prepared from strain 171 on the 107th day of pregnancy and aborted a dead fœtus 83 days afterwards. The abortion took place during the night and the placenta was eaten by the cow. Bang's bacillus was recovered in pure culture from the stomach of the fœtus. The blood titre rose gradually after vaccination and was positive in 1 in 200 at the time of abortion. The cow became pregnant again at first mating 136 days after aborting and her second pregnancy terminated by the birth of a fully developed calf on the 278th day. The fœtal membranes appeared normal: microscopic examination and a biological test of material from the cotyledons were negative. From the date of abortion and during the course of the second pregnancy the blood titre remained consistently high, showing at one period a complete reaction in 1 in 6,400. The milk was positive on biological test and on monthly agglutination test in dilutions of 1 in 200.

Heifer No. 9.

This animal received subcutaneously 50 c.c. living vaccine, strain 122, when 240 days pregnant, and a further 150 c.c. vaccine, strain "King," 28 days later. The pregnancy terminated on the 288th day by the birth of a strong fully developed calf. The vaccination was deferred until rather late in pregnancy owing to a misunderstanding as to correct date of service. The large second dose of vaccine was given as there was a very poor reaction to the first vaccination, and to ascertain what effect it would have on an animal in the advanced stage of pregnancy. Parturition took place during the night and the placenta was not available for examination. After the vaccinations the blood titre remained low, never rising above a complete reaction in 1 in 50. The colostrum whey at the time of calving reacted up to 1 in 100, while biological tests (2) of milk three weeks afterwards, and subsequent monthly agglutination tests were negative. The cow was mated 164 days after parturition and became pregnant to the first service; her second pregnancy terminated at 284 days in the birth of a vigorous fully developed calf. The placenta was cast one hour after calving, appeared normal; microscopic examination and biological tests (2) of material from the cotyledons were negative. From the date of calving and during the second pregnancy the blood titre remained low, not exceeding 1 in 50 until the 5th month of the pregnancy when it became negative and remained so. Monthly agglutination tests of the milk were consistently negative.

Heifer No. 10.

This animal received 100 c.c. living vaccine, strain 122, when 184 days pregnant and had a normal parturition 101 days afterwards in the birth of a fully developed vigorous calf. The placenta was expelled within two hours of calving and appeared normal; microscopical examination and biological tests(4) of material from the cotyledons were negative. The heifer's blood titre never rose above 1 in 100 uhtil the last month of pregnancy when it was incomplete in 1 in 200 and fell to 1 in 25 after calving. The colostrum was negative to the agglutination test, but one of two guinea pigs inoculated gave a low positive reaction. The cow was mated 162 days after parturition and became pregnant to the first service. The second pregnancy terminated at 280 days in the birth of a fully developed healthy calf. The placenta was expelled shortly after calving and was not available for examination. The blood titre, which during the interval between the first and the second pregnancy remained around 1 in 100, was somewhat erratic during the latter, being negative in the second month, rising to 1 in 100 at the sixth month and declining to 1 in 25 during the eighth and ninth months. The milk was negative to agglutination tests.

Heifer No. 11.

This heifer received 100 c.c. living vaccine, strain "King," subcutaneously when 162 days pregnant and gave birth to a healthy fully developed calf 133 days afterwards on the 295th day of the pregnancy. The calf was born during the night and the afterbirth was not available for examination. The blood titre rose to 1 in 100 a month after vaccination, and declined to 1 in 50 a month afterwards at which it remained during the pregnancy. The milk was negative to agglutination test and biological tests (2) a fortnight after calving. During the interval between the first and second pregnancy the blood titre varied from negative to 1 in 25 and the milk titre was negative. The cow was mated 104 days after parturition, became pregnant and gave birth to a fully developed vigorous calf on the 289th day of the pregnancy. The placenta was expelled within an hour and was normal in appearance; microscopic and biological tests (2) of material from the cotyledons were negative. The blood titre was negative during the course of the second pregnancy except for the test at the fourth month when it reacted in 1 in 25. The milk whey titre was consistently negative throughout.

Heifer No. 12.

This animal was inoculated with 50 c.c. vaccine, strain "King," when 89 days pregnant and gave birth to a healthy fully developed calf on the 280th day of the pregnancy. The placenta was expelled four hours afterwards and appeared normal; microscopic examination of smears from the cotyledons was negative, but the blood of two guinea pigs inoculated intraperitoneally with emulsion from the cotyledons gave positive reactions of 1 in 50 three months afterwards. The blood titre rose to around 1 in 100 during the three months following vaccination and then declined to 1 in 25 at the fifth month of pregnancy and was negative at the 9th month. The colostrum was negative to agglutination test. The blood and milk titres were negative during the interval between pregnancies. The cow was served 95 days after parturition and became pregnant. The second pregnancy terminated at 283 days with the birth of a fully developed healthy calf. The placenta was not available for examination. Uterine discharge, however, was negative on biological tests (2). The blood was negative during this pregnancy except on two occasions when it gave complete reactions in 1 in 25, and on one occasion when it rose to 1 in 50, incomplete. The colostrum was negative to agglutination and biological tests (2) and the milk titre remained negative throughout the pregnancy.

Heifer No. 13.

This heifer received a 100 c.c. living vaccine, strain 171, when 142 days pregnant and gave birth to a fully developed calf 141 days afterwards. The fœtal membranes were expelled within three hours and appeared normal. The blood titre rose to 1 in 200 shortly after vaccination and declined to 1 in 50 before calving. The colostrum gave positive reactions to the agglutination and biological tests, but subsequent monthly tests of the milk were negative. During the interval between pregnancies the blood titre fell immediately after calving to a slightly positive in 1 in 50 but rose to 1 in 100 two months later. The cow was mated 93 days after parturition, became pregnant and gave birth to a healthy fully developed calf on the 282nd day of the pregnancy. The placenta was expelled three hours afterwards and was normal in appearance; microscopic examination and biological tests (2) of placental tissue were negative. The blood titre remained low showing complete reactions in 1 in 25 except at the 8th month when it reacted at 1 in 50; the milk whey titre was negative during the course of the second pregnancy.

Heifer No. 14.

This animal was vaccinated with 100 c.c. living vaccine, strain 212, when stated to be 123 days pregnant and 70 days later received 50 c.c.

vaccine of the same strain. The pregnancy terminated 64 days after the second vaccination in the birth of a healthy fully developed calf. This heifer was pregnant when purchased, and as she apparently carried her calf to full time it is most likely that the date of mating was earlier than that stated by the previous owner. The fœtal membranes came away shortly after calving and were normal in appearance. The colostrum gave a positive reaction to the agglutination test complete up to 1 to 100, but the milk a fortnight after calving was negative to the agglutination and biological tests (2) and remained negative on subsequent monthly agglutination tests. The blood titre rose to 1 in 100 after the first vaccination and to 1 in 200 after the second vaccination, but fell to 1 in 100 before calving. The cow was mated 147 days after parturition, became pregnant, and gave birth to a fully developed healthy calf 285 days later. The placenta came away two hours after calving and was normal in appearance; microscopic examination of smears from the cotyledons was negative; two guinea pigs were inoculated with the placental material and one gave a negative and one a positive blood reaction. During the second pregnancy the blood titre fluctuated but never rose above 1 in 50 and was negative at time of calving. The milk whey titre was negative throughout.

Heifer No. 15.

This animal received subcutaneously 100 c.c. living vaccine, strain 172, when 130 days pregnant and 77 days later 50 c.c. vaccine of the same strain. The heifer died when 261 days pregnant from blackquarter. The *post-mortem* examination revealed a normally developed fœtus in the uterus. The blood titre rose to 1 in 50 complete after the first vaccination and to 1 in 100 after the second. Apparently this heifer, had she lived, would have produced a fully developed calf at full time. There was no naked-eye evidence to indicate infection in the uterus or the fœtal membranes.

Heifer No. 16.

This animal was inoculated subcutaneously with 50 c.c. living vaccine, strain 172, when 204 days pregnant and gave birth to a healthy fully developed calf 281 days after mating. The fœtal membranes appeared normal and the milk was negative to agglutination test. The blood titre rose to 1 in 100 shortly after vaccination but declined to 1 in 50 before calving. Eighty-one days after parturition the cow was mated and became pregnant. The second pregnancy terminated at 287 days in the birth of a healthy fully developed calf. The placenta appeared normal and microscopical examination and biological tests (2) of material from the cotyledons were negative. The milk was negative to agglutination test throughout. The blood titre remained low during this pregnancy, rising to 1 in 50 on only two occasions and falling to zero before calving.

Heifer No. 17.

This animal was inoculated subcutaneously, when 195 days pregnant, with 50 c.c. living vaccine, strain 212, and gave birth to a fully developed calf 288 days after mating. The placenta was not available for examination. The blood titre rose to over 1 in 100 after vaccination, declined to 1 in 50, but rose again to 1 in 100 before calving. The milk, which was negative at time of calving, became positive to agglutination test three weeks afterwards, and remained positive for the subsequent 12 months except on one test. For the remainder of the lactation period the milk gave a negative reaction to agglutination tests and to two biological tests. This animal failed to come in œstrum during the 14 months following parturition. Examination of the genital organs during this period revealed the ovaries somewhat enlarged, smooth, with no evidence of follicles or corpora lutea. The uterus was normal. The blood titre rose to 1 in 200 for two months after calving and then gradually declined to 1 in 50 four months later and remained at or below this level. The animal failed to conceive until the third service one year and seven months after calving. The second pregnancy terminated on the 286th day with the birth of a fully developed calf. The fœtal membranes were not available for examination.

TABLES AND CHARTS

Table I.

First Pregnancy.

Heifer.	Days Pregnant.	Vaccination. Dose.	Strain.	Pregnancy Terminated by.	Condition of Afterbirth.
8	107	50 c.c.	171	Abortion 190th day	(Fœtus Positive.)
9	240	50 c.c.	122	Live calf 288th day	—
	268	50 c.c.	"King"		
10	184	100 c.c.	122	Live calf 285th day	Normal.
11	162	100 c.c.	"King"	Live calf 295th day	—
12	89	50 c.c.	"King"	Live calf 280th day	Normal.
13	142	100 c.c.	171	Live calf 283rd day	Normal.
14	123?	100 c.c.	212	Live calf 257th day?	Normal.
	190?	50 c.c.	212		
15	130	100 c.c.	172	Death 261st day...	Normal.
	207	50 c.c.	172		
16	204	50 c.c.	172	Live calf 281st day	Normal.
17	195	50 c.c.	212	Live calf 288th day	—

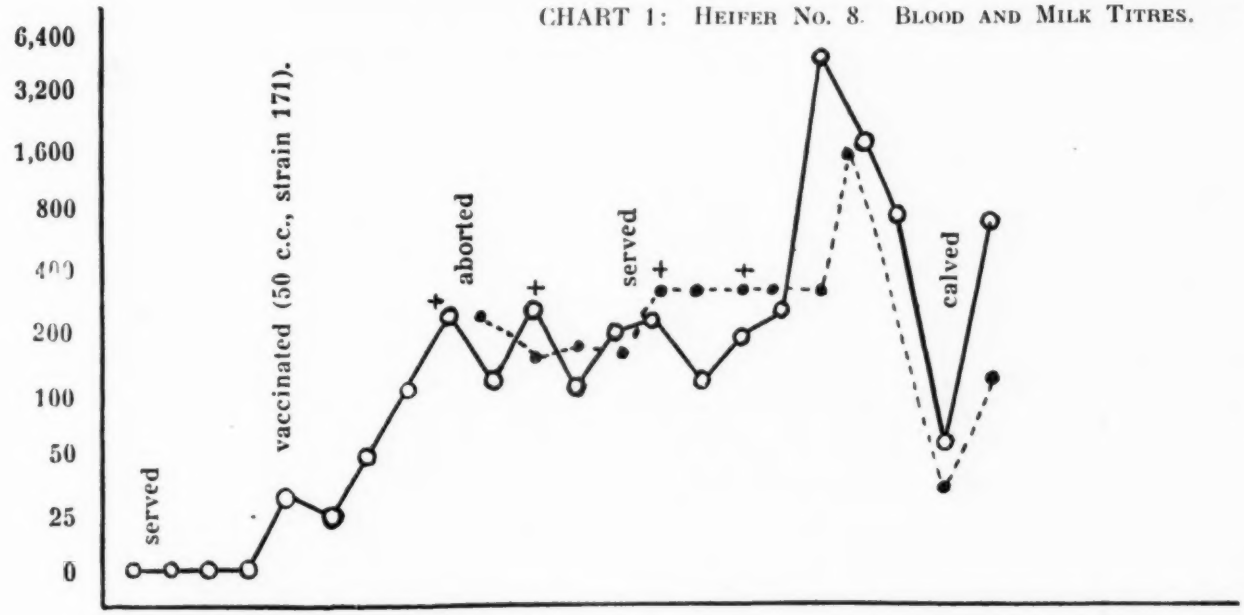
Table II.

Second Pregnancy.

Cow.	Mated days after first parturition.	Pregnancy terminated.	Condition of Afterbirth.
8	... Once on 136th day	... Live calf 278th day ...	Normal.
9	... Once on 164th day	... Live calf 284th day ...	Normal.
10	... Once on 162nd day	... Live calf 280th day ...	—
11	... Once on 104th day	... Live calf 289th day ...	Normal.
12	... Once on 95th day	... Live calf 283rd day ...	—
13	... Once on 93rd day	... Live calf 282nd day ...	Normal.
14	... Once on 147th day	... Live calf 285th day ...	Normal.
16	... Once on 81st day	... Live calf 287th day ...	Normal.
17	... On 488th, 549th and 569th day.	... Live calf 286th day ...	—

In all Charts :—Blood titre O—O—O; Milk titre ●--●--●

CHART 1: Heifer No. 8. Blood and Milk Titres.



+ End point not determined.

CHART 2: Heifer No. 9. Blood and Milk Titres.

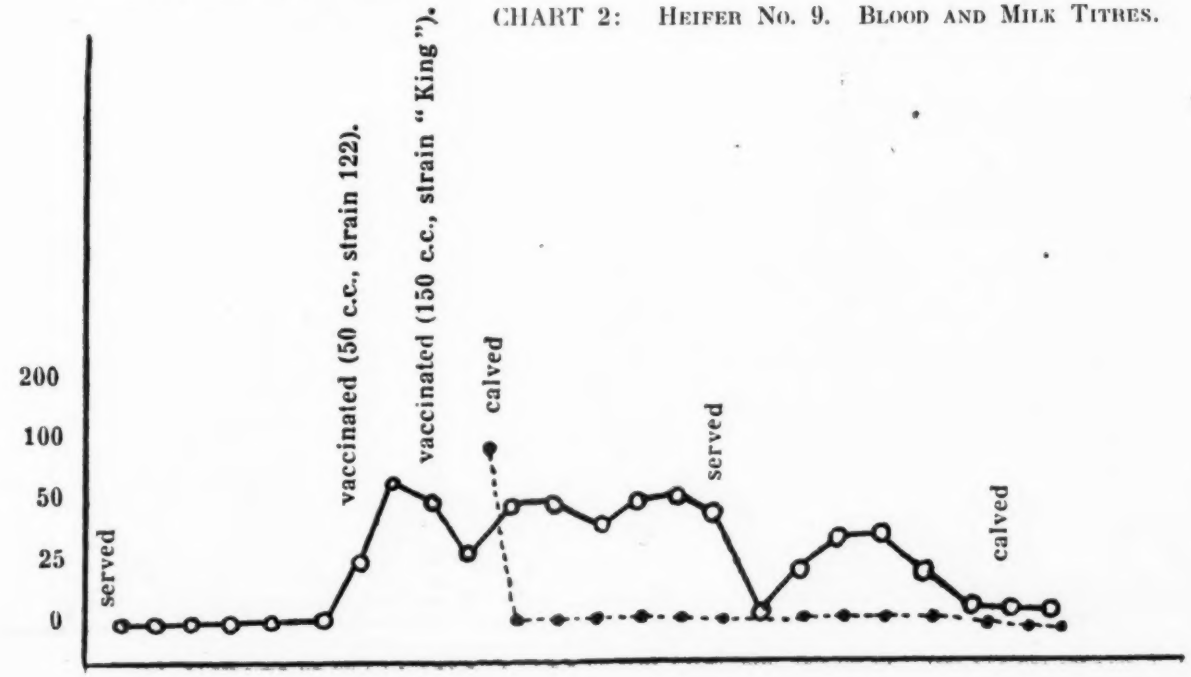


CHART 3: Heifer No. 10. Blood and Milk Titres.

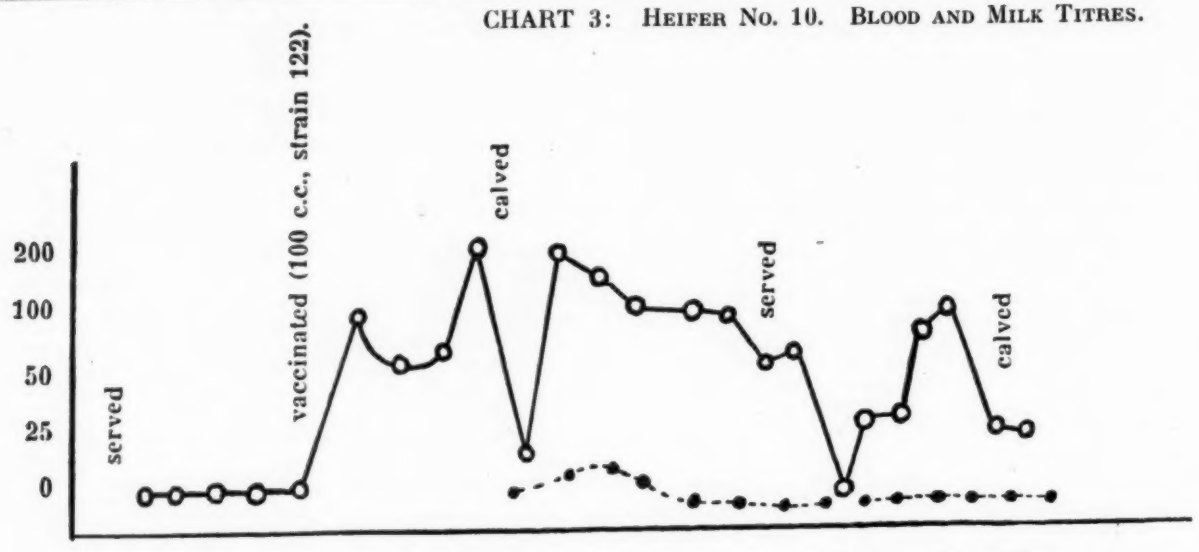


CHART 4: Heifer No. 11. Blood and Milk Titres.

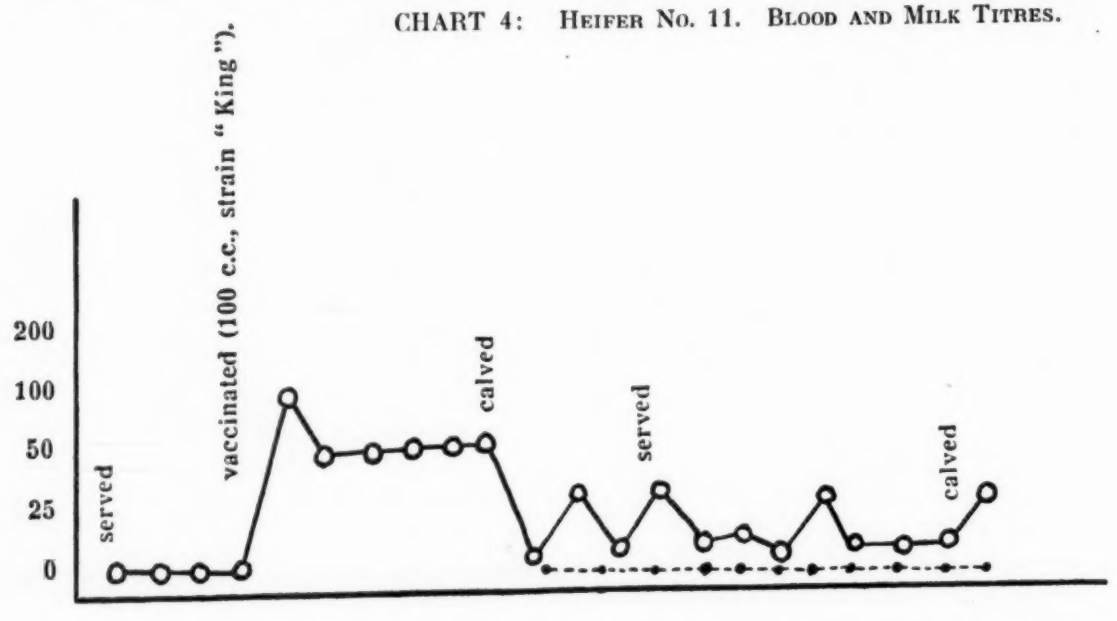


CHART 5: Heifer No. 12. Blood and Milk Titres.

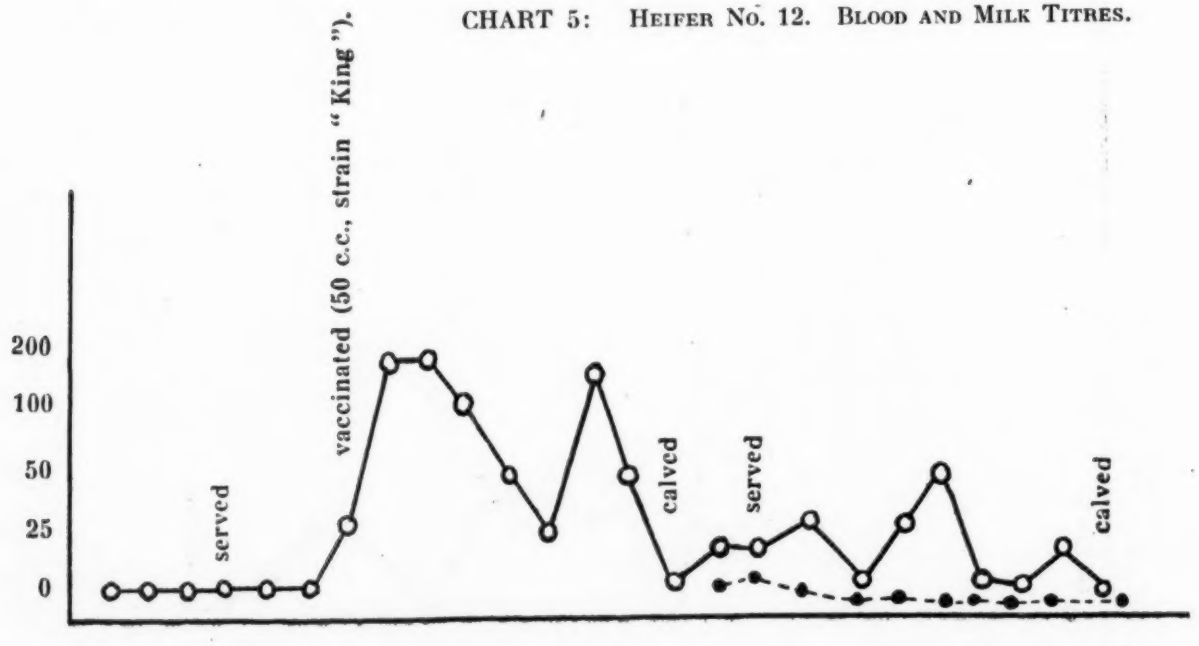


CHART 6: Heifer No. 13. Blood and Milk Titres.

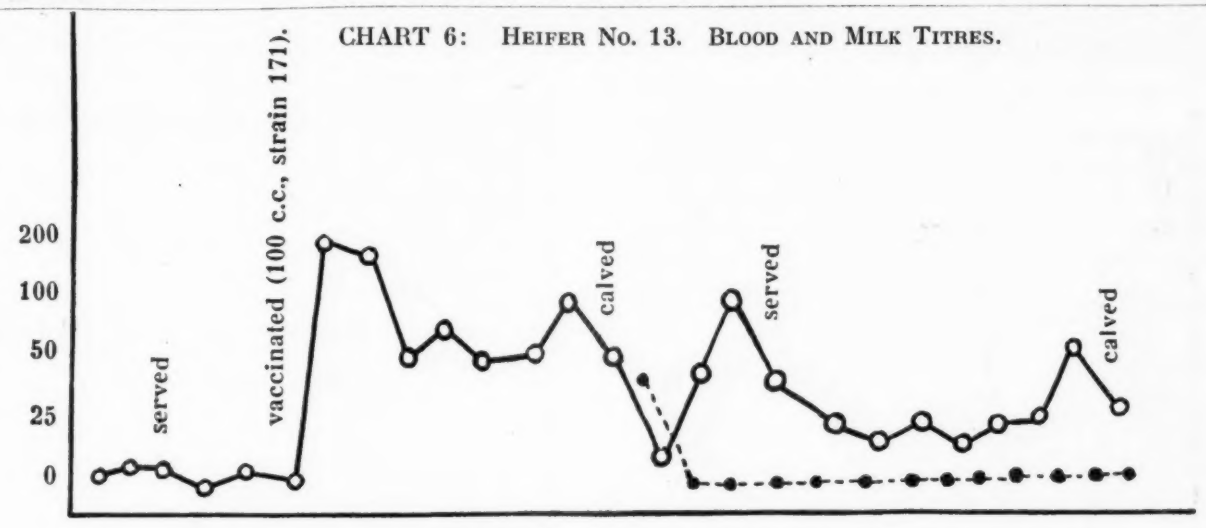


CHART 7: Heifer No. 14. Blood and Milk Titres.

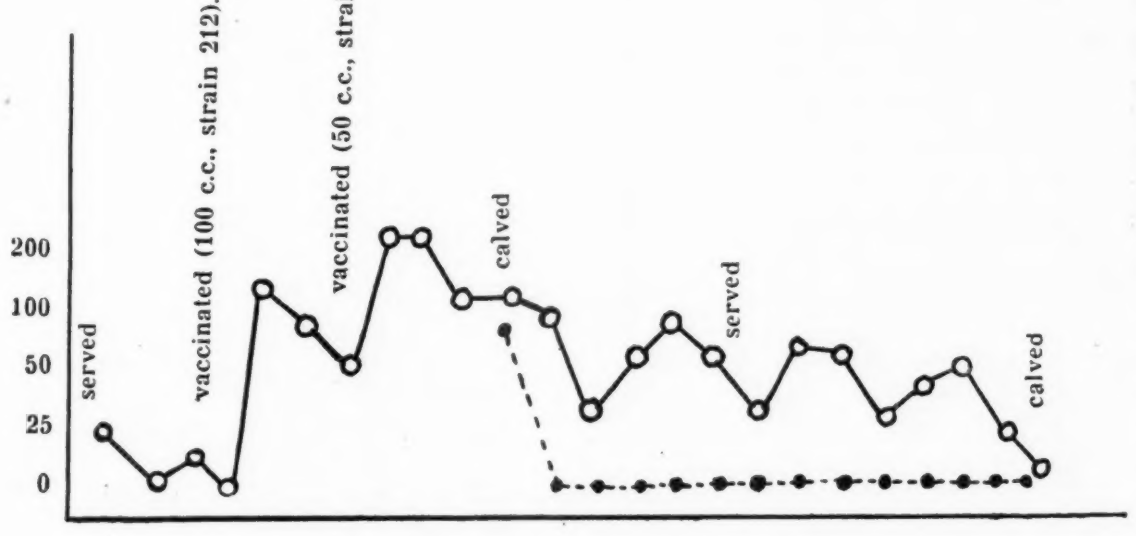
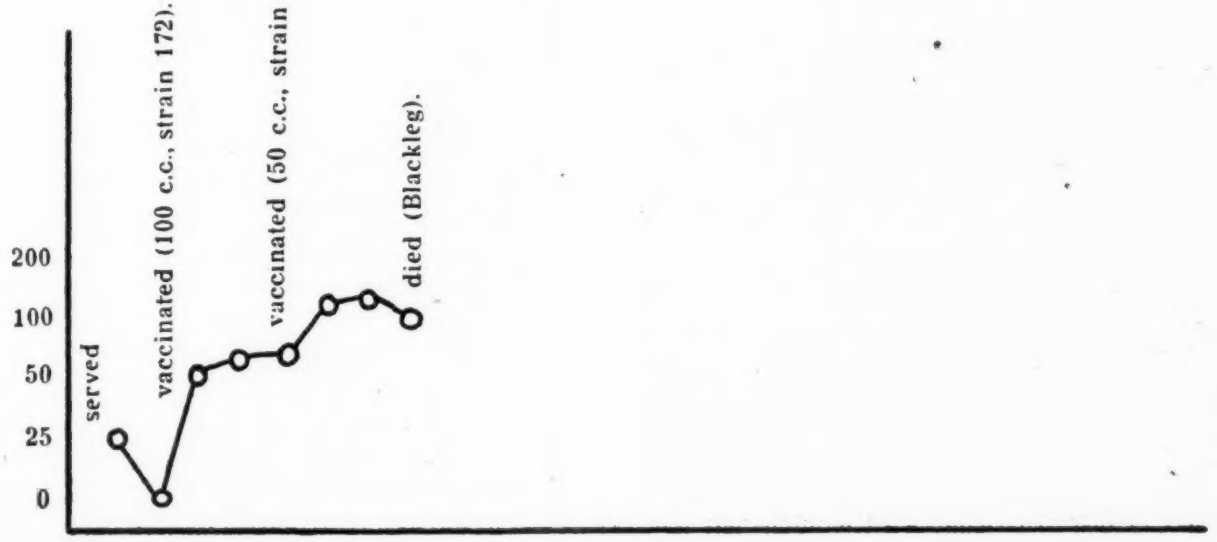


CHART 8: Heifer No. 15. Blood Titre.



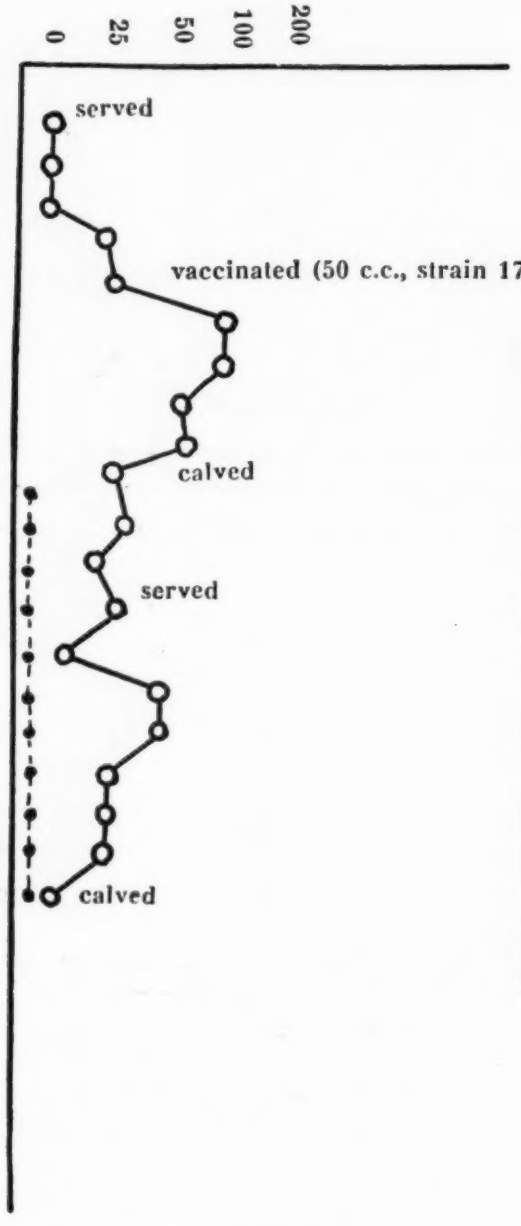


CHART 9: Heifer No. 16. Blood and Milk Titres.

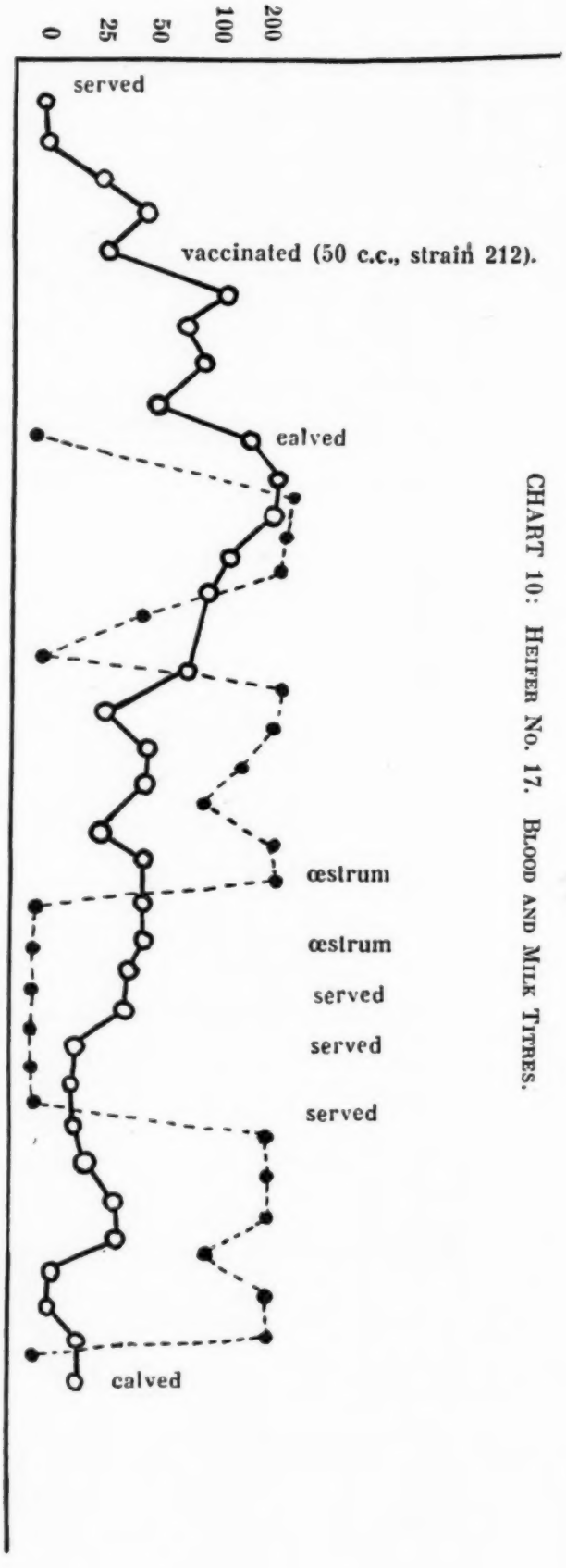


CHART 10: Heifer No. 17. Blood and Milk Titres.

III. Discussion

All heifers in the experiments became infected following vaccination and had not recovered by the end of the second pregnancy, with the exception of No. 9, whose blood titre was negative for the last two months of her second pregnancy, and No. 11, who also showed a negative blood titre for three consecutive months during the last stage of her second pregnancy. Heifers Nos. 10, 12, 13, 14, 16, all registered low and declining blood titres after the initial rise following vaccination. In none of the above heifers did udder infection become established, as judged by the results of agglutination test of the milk whey; although the colostrum of heifers Nos. 9, 13 and 14 gave positive agglutination reactions, and heifer No. 10 a low positive reaction to a biological test.

Heifer No. 8 aborted and ran a consistently high blood titre; heifer No. 17 registered a titre of 1 in 50 or over for a long period, both these animals showed evidence of udder infection. During the first pregnancy all heifers, with the exception of heifer No. 8, which aborted, and heifer No. 15, which died, carried their calves to full time; the fœtal membranes were expelled shortly after calving and in the cases of six heifers (Nos. 10, 12, 13, 14, 15, 16) where the membranes were available for examination they appeared normal, although those of heifers Nos. 12 and 14 were positive on biological test. During the second pregnancy all animals, including No. 8, carried full time; the placentæ were dropped shortly after calving and in the cases of six animals (Nos. 8, 9, 11, 13, 14, 16) in which they were available for examination were normal in appearance. It will be seen that cows Nos. 8 and 17 became "carriers" with udder infection, while in the remaining seven animals udder infection did not become established, and they were slowly recovering from the effects of vaccination at the end of their second pregnancies.

The results of the experiments clearly indicate that strains of *Br. abortus* cultivated outside the animal body for over 15 years may still possess sufficient virulence, when injected subcutaneously into pregnant heifers, to produce infection, which may result in some cases in abortion or udder infection. The dose of vaccine used in each case may be considered large, but as the object of the experiments was to obtain information on the harmful results, if any, of vaccinating pregnant heifers with old strains of *Br. abortus,* it was considered advisable to use doses which were not less than those generally employed in veterinary practice. The size of dose does not, however, appear to be highly important as 50 c.c. doses gave apparently similar results to doses of 100 c.c. or more. The experiments fail to show that any one of the five strains used possessed exceptional virulence; the strain 171 which caused abortion and udder infection in heifer No. 8 only produced a slight and declining infection in heifer No. 13, although the dose of vaccine used was double that given to heifer No. 8. Probably varying animal susceptibility to *Br. abortus* is a more important factor in influencing the course of infection than the strain of the organism used or the dose employed.

It is of interest to note that cow No. 8, while showing a high blood titre and evidence of udder infection following abortion and ingestion of infected placenta, had a normal calving; the fœtal membranes exhibiting no macroscopic evidence of infection. All animals, except No. 17, became pregnant a second time without undue delay and to a single mating, vaccination having no apparent influence on their breeding efficiency. There is no evidence that the temporary sterility of cow No. 17 was connected in any way with vaccination.

Conclusions

(1) Old strains of *Br. abortus* cultivated outside the animal body for over 15 years, when injected subcutaneously into pregnant heifers in doses similar to that used in vaccination against bovine abortion, produce infection in all animals which may lead, in some instances, to abortion and udder infection, or to the "carrier" state with udder infection.

(2) In a high percentage of cases vaccination of pregnant heifers with old strains of *Br. abortus* would probably not result in the exhibition of any clinical signs of infection, although in every case a more or less mild infection would in fact follow and persist for a year or more.

(3) It is undesirable to vaccinate pregnant heifers or cows with living cultures of so-called avirulent or old strains of *Br. abortus* as it is likely to result in a low percentage of the animals aborting or showing udder infection or becoming permanent "carriers."

(4) Vaccination appears to have no adverse influence on fertility.

I am indebted to my colleagues of the Laboratory Staff for valuable assistance in this work.

References

(1) Craig and Kehoe, *J. Compar. Path. and Ther.* Vol. XXXV. pp. 256-273.

(2) Healy, J. E. Report of the Governors, Munster Dairy School, 1918.

Dr. J. B. ORR ON THE MILK SUPPLY

In the course of the Chadwick Public Lecture at the Royal United Service Institution on May 29th, Dr. John Boyd Orr, whose subject was "The Normal Food Supply and Public Health," said that production of the more expensive foodstuffs was increasing in efficiency with a corresponding fall in wholesale prices. Distribution, however, was still relatively inefficient and expensive. The commodity of greatest importance in this respect was milk. The cost of distribution was excessive: the retail price was so high that its use was restricted in the poorest classes. Nor was the quality satisfactory, the present state of the milk supply was a reproach. Milk to-day was in somewhat the same position as water was a hundred years ago. The provision of an abundant pure supply at a price that would bring it within the reach of the poorest was probably the most urgent social reform needed at the present day.

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The Riga Correspondent of *The Times* reports that rabies is causing excitement in the countryside in South-East Estonia, and there is a widespread hunt for stray dogs and cats. A scare began a fortnight ago when one mad dog bit twelve persons and a number of domestic animals. In consequence of other cases, the authorities began a thorough investigation of suspected animals. Over 100 dogs and about the same number of cats are reported to have been destroyed. Altogether about 20 persons are reported to have been bitten. They are being conveyed to Tallinn for treatment at the Pasteur Institute there.

A SHORT NOTE ON THE VARIATION IN NUTRITIONAL VALUE OF DOG FOODS*

PHYLLIS M. KON (PHYLLIS M. EDMUNDS)
Reading

The use of various patent dog foods is becoming more and more popular in the dog world, and large kennels especially use dog biscuits in one form or another as a staple and sometimes almost exclusive diet. This practice tacitly assumes that all such biscuits constitute an adequate and satisfactory diet for the dog.

Some time ago, I was asked by Mr. W. L. Little, F.R.C.V.S., Reading, to test out in feeding experiments on rats, the nutritional value of four hound meals, one of which was suspected of not being satisfactory. It is probably unnecessary to say here that rats have been extensively and increasingly used in the last two decades for the investigation of nutritional problems, and that very many recent important discoveries relating to human and animal nutrition are largely due to experiments carried out on this omnivorous rodent. It might be added that, as far as we know at present, the vitamin requirements of dogs and rats are very similar. Both species, for example, are able to dispense with an exogenous supply of vitamin C and are very susceptible to a deficiency of vitamin A and of the vitamin B complex. There is little doubt that a diet, proved to be unsatisfactory for the rat, would also be unsatisfactory for the dog, if fed for any length of time.

The experiments described below demonstrate the existence of marked differences in the nutritional value of various hound meals. One of them proved to be seriously lacking in several essential constituents of a diet, so that it could not possibly be expected to form a satisfactory staple food for the dog.

* Under Home Office Licence.

Experimental

Description of Hound Meals Tested

Meal 1.—A wholemeal biscuit food containing dried meat.

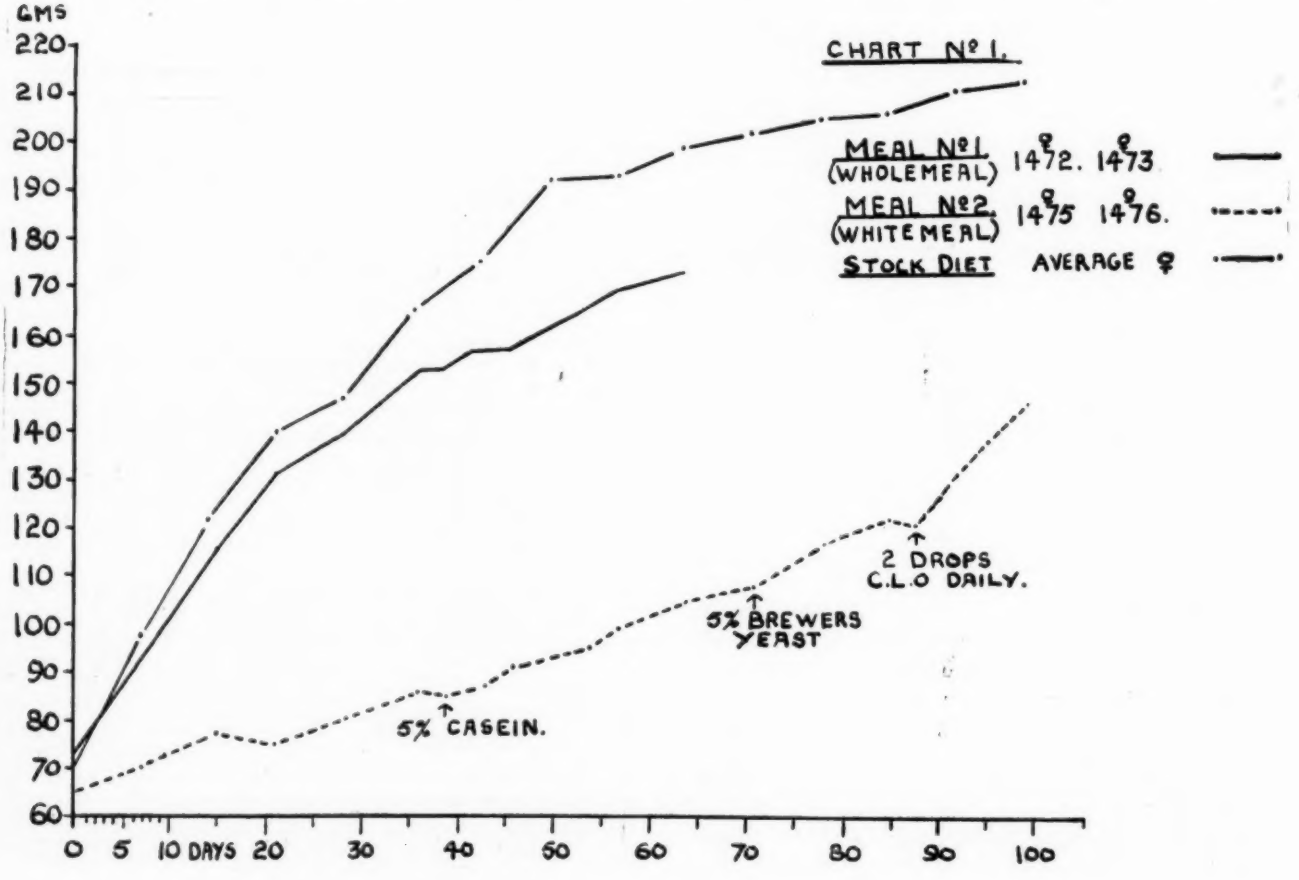
Meal 2.—A whitemeal or whiteflour biscuit food containing dried meat.

Meal 3.—A wholemeal biscuit food without dried meat.

Meal 4.—A whitemeal or whiteflour biscuit food containing dried meat but a much coarser type of biscuit than Meal 2.

These meals were bought in Reading.

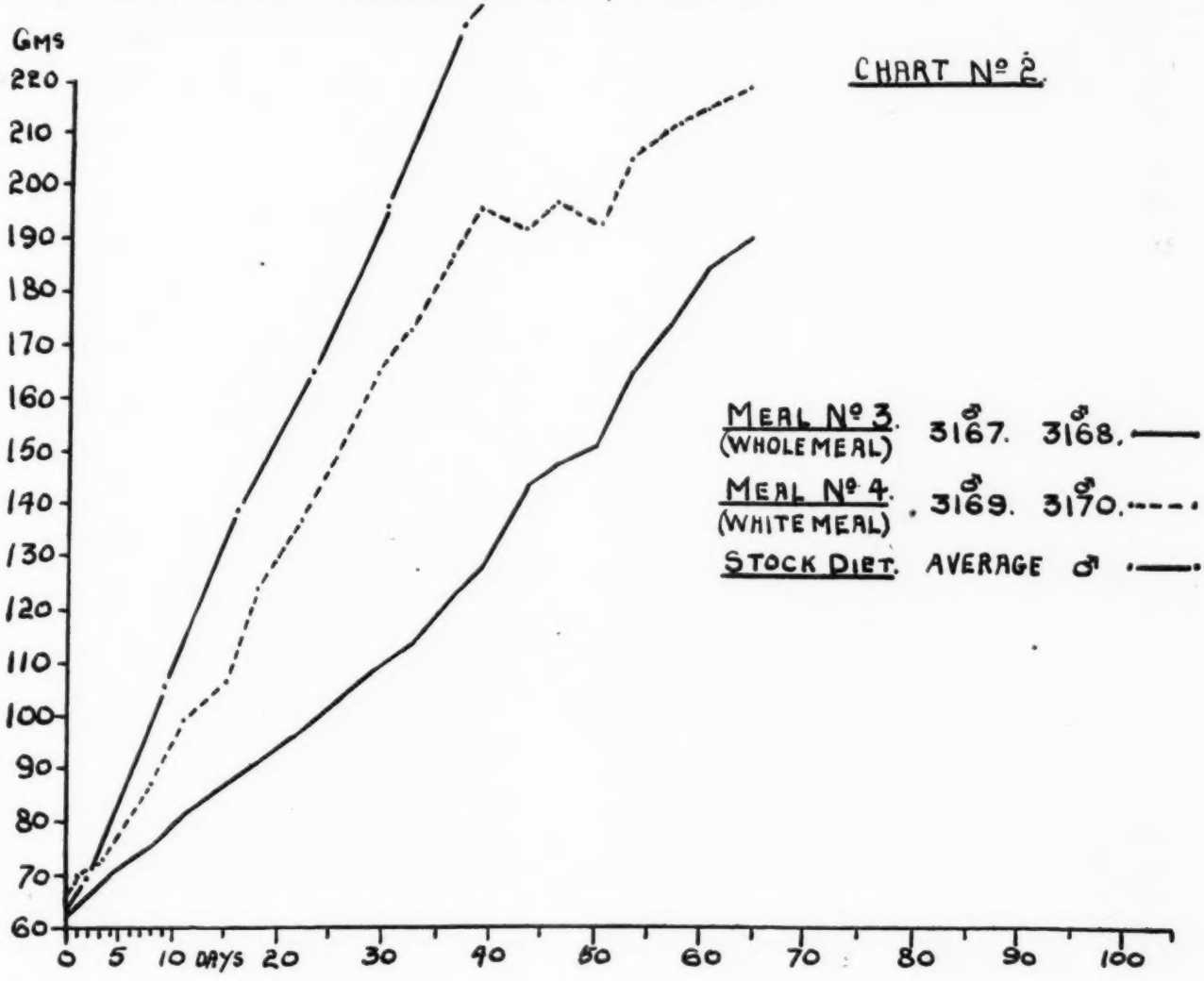
The tests were carried out on Hooded Norwegian rats between 50 and 80 grams weight, two rats being used for each test. The rats were



kept in pairs in cages, given free access to water and fed solely (with the exception stated below) on the ground biscuit food which they had *ad lib.* The experiments lasted from two to three months. The average growth curves of the rats over the experimental period are given in Charts 1 and 2. It should be noted here that males grow more rapidly than females and reach a higher weight.

It will be seen from the charts that Meal 1, a wholemeal biscuit, proved to be a fairly adequate diet for the rat, giving good though not optimal growth for female rats over the experimental period; at the end of which the rats were in good health, had sleek coats and handled well. Meal 2, a whitemeal biscuit, gave a very different picture. As the chart shows, the animals receiving this food lagged very badly from the start behind those on Meal 1. After five weeks, when the animals receiving Meal 1 weighed almost twice as much as those receiving Meal 2, the diet of the latter was supplemented by the addition of 5 per cent. vitamin-free casein. This addition of adequate protein brought about only a very slight improvement. Likewise, after ten weeks, the addition to the diet of 5 per cent. brewers' yeast (a potent source of the vitamin B complex) did not appreciably improve the growth of the rats. A marked improvement both in appearance and weight was observed, however, when the rats were given 2 drops of cod-liver oil daily in addition to the biscuit meal plus casein plus brewers' yeast. This demonstrates that the diet was deficient in fat soluble vitamins, most probably vitamin A, as will be discussed below. There is little doubt that the hound meal was also deficient in other respects as the poor growth in the early stages of the experiment could not be explained on the basis of a deficiency of vitamins A and D, as these are stored in the body and would have been carried over from the period of normal feeding.

In the second experiment (Chart 2) the position was reversed. The whitemeal biscuit gave better results than the wholemeal (minus meat). The rats on Meal 4 (white meal) grew better, handled better, and had better coats than those receiving meal 3 (wholemeal). Both meals gave better results than Meal 2 in the previous experiment, although neither of them gave results equal to those that can be obtained on a good laboratory mixed diet.



Discussion

These few experiments show plainly that dog foods differ greatly in their nutritional value, and that there are on the market preparations which are quite unsatisfactory in this respect. Even the best of the foods tested were insufficient to produce, in the experimental rats, the standard of growth and condition easily obtainable on stock laboratory diets, and there is little reason to assume that when fed alone these foods would be optimal for the dog.

All dog biscuits contain large amounts of carbohydrate in a dry form and therefore constitute a good source of energy, although some of them unfortunately cannot be looked upon as much more. Broadly speaking, a dog's diet should contain in addition to the sources of energy (carbohydrate and fat) adequate protein, a satisfactory supply of minerals together with the accessory food factors, vitamins A, B complex, D and E.

Taking, for example, a wholemeal biscuit containing meat and bones, we might expect it to satisfy the protein requirements and also to provide the necessary minerals provided common salt had been added in the course of manufacture.

Vitamin B complex and vitamin E would be supplied in the cereal part of the meal. Vitamins A and D, however, would most likely be the limiting factors in even the best dog foods of this type. Very little, if any, vitamin A would be supplied by the wholemeal and although meat might be expected to supply some, this would most probably be destroyed in the course of autoclaving and drying. This was undoubtedly true in the case of Meal 2 where a shortage of vitamin A was apparent.

It should be noted that experiments of the type described above, would not disclose the absence of vitamin D. Although rats are very susceptible to rickets under suitable experimental conditions, a special high calcium/low phosphorus diet combined with a deficiency of vitamin D is necessary in order to produce this disease in the rat. In the dog, a deficiency of the vitamin alone, even in the presence of a correct calcium/phosphorus ratio will cause the appearance of florid rickets. It is needless to say that the dog is very susceptible to rickets and has been successfully used by Mellanby in his pioneer experiments on this malady.

In the light of our present knowledge of nutrition, we are definitely entitled to suspect dog foods composed only of cereals and meat, of being seriously deficient in the antirachitic factor. Unless the missing vitamin is supplied, such biscuits alone, or even supplemented with cooked meat and gravy, as is frequently the practice, will not constitute an adequate diet for young growing dogs. Winter puppies are in greater danger in this respect than are summer puppies which are exposed to sunlight. Vitamins A and D can be easily supplied, and the cheapest and simplest way would probably be to supplement the hound meal with a good brand of cattle cod-liver oil. There are also now on the market an increasing number of patent dog foods containing vitamin D.

In general it would seem that a closer study of the nutritional requirements of the dog might help the veterinary surgeon in elucidating some of the more obscure cases met with in every-day practice.

I wish to thank here Mr. W. L. Little for supplying the hound meals tested, and my husband, Dr. S. K. Kon, for his help and advice.

Biographical Article

MAJ.-GEN. SIR JOHN MOORE,

K.C.M.G., C.B., F.R.C.V.S.

It is with pride that we have to place on record the long, honourable and memorable career of Major-General Sir John Moore, K.C.M.G., C.B., F.R.C.V.S., whose seventieth anniversary of his birth was attained on May 24th, 1934.

It is not in mere terms of peregrinations that his achievement can be estimated, but it is on the outstanding services that Sir John has given, and continues to give, to the Army and to the Veterinary Profession as a whole, that any real appreciation must be based, as the following narrative will show.

He was born on May 24th, 1864, at Longhurst, near Morpeth in the County of Northumberland, of yeoman stock. At the age of 17 years, having been so much in touch with animals of the farm, he decided to take up the career of a veterinary surgeon, doubtless attracted by the fact that his uncle, the late Lieutenant-Colonel R. Moore, Army Veterinary Department, had adopted that career and for long was associated with the Army.

Sir John enrolled as a student at the New Veterinary College, Gayfield House, Edinburgh, in October, 1882, the complete course in those days being of three years' duration. His career as a student was a distinguished one, for he gained, among other awards, four of the silver medals presented by the Highland and Agricultural Society of Scotland, *viz.*, Materia Medica (1883), Physiology (1884), Anatomy (1884), and Horse Pathology (1885); the Gold Medal (or £20 equivalent) presented by Professor W. Williams for the best student in 1st and 2nd years, and the Second FitzWygram prize of £30 (1885). Graduating M.R.C.V.S. on April 22nd, 1885, he secured his Diploma of Fellowship on April 24th, 1890.

Following a period of four and a half years

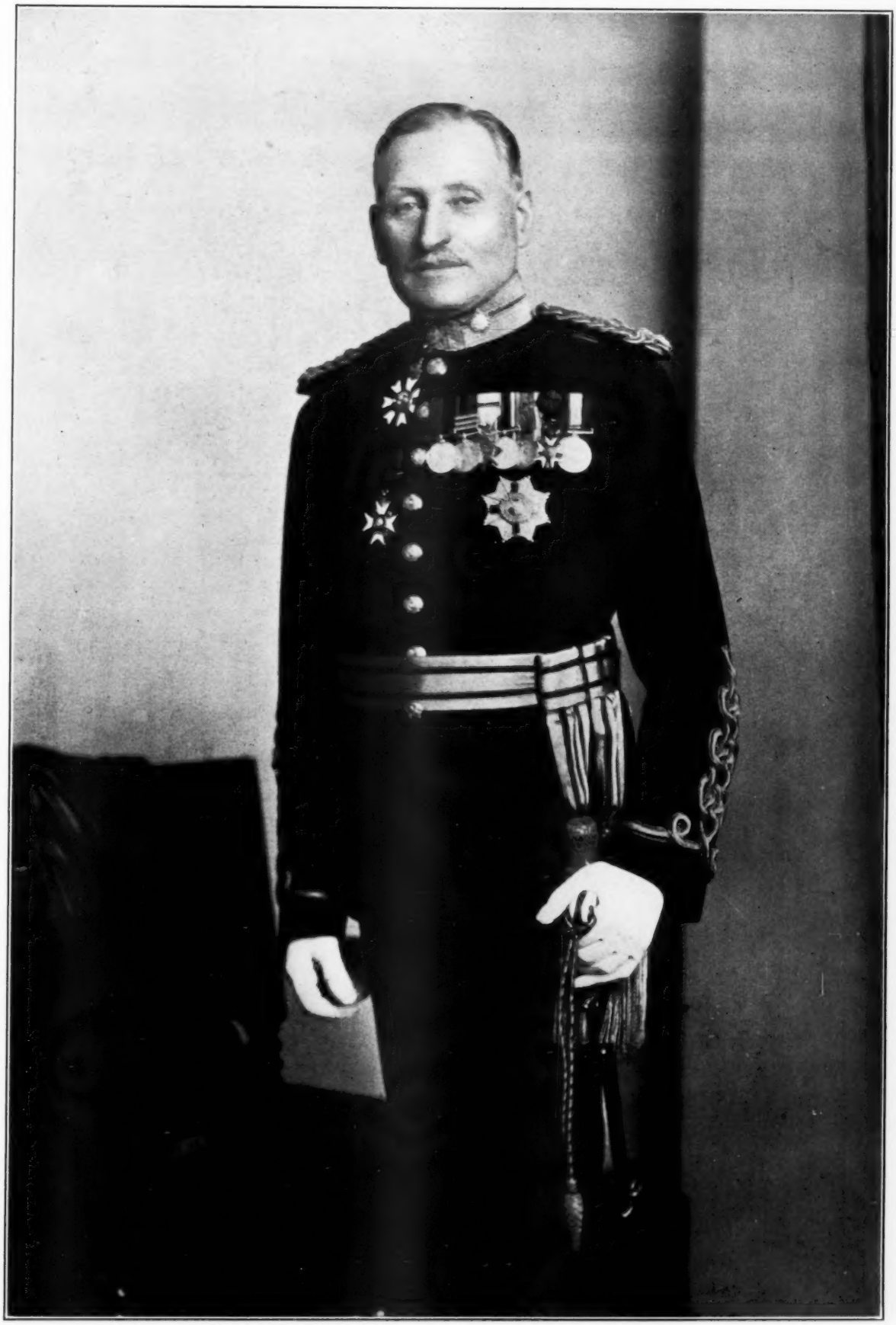


Photo.: Elliot and Fry, Ltd., 63, Baker Street, W.]

MAJOR-GENERAL SIR JOHN MOORE, K.C.M.G., C.B., F.R.C.V.S.

in practice in Manchester, with Tedbar Hopkin (1885-1889), he was appointed to a Commission in the Army as Veterinary Surgeon on December 18th, 1889; promoted Veterinary Surgeon, 1st Class, on December 18th, 1899; Major November, 1900; Lieutenant-Colonel December 12th, 1906; Colonel October 15th, 1913; Brigadier-General August 5th, 1914; Major-General January 1st, 1918.

During his Army career, Sir John rendered service in many capacities. He proceeded to India for a tour of service overseas in 1890. For this tour he was stationed at Cawnpore for two years, and during that period he was sent on a lonely excursion to remote Lushai Land to investigate a disease amongst Government transport bullocks. He then spent four years on Remount Purchasing Duty at Calcutta, which included a visit to Australia in 1894.

Service with the Indian Contingent under General Sir Charles Egerton in the Sudan at Suakim followed from June to November, 1896.

He was then attached to the 3rd Dragoon Guards as Veterinary Officer at Woolwich in December 1896, and at York in 1897-98.

Sir John was employed with the Remount Purchasing Commission in Argentine in 1898, and had charge of a shipment of horses to South Africa. In the same year he returned to England and rejoined the 3rd Dragoon Guards, accompanying that regiment to Dundalk, Ireland.

In July, 1899, he accompanied a party of officers under Colonel (afterwards Lord) Plumer to South Africa, and saw service in Rhodesia, Transvaal, and was present at the Relief of Mafeking on May 17th, 1900.

On return to England in October, 1900, he proceeded with a Remount Purchasing Commission in U.S.A. until the close of the South African War. He held the appointment of Commandant, Lathrop Remount Depôt, through which some 90,000 horses and mules passed, all of which were subjected to the mallein test (subcutaneous method) before shipment to South Africa.

Returned to Home Service in June, 1902, and was attached to the Remount Department at the War Office for Registration of horses for the Army Reserve.

PHOTOGRAPH OF PROFESSORS
at the
NEW VETERINARY COLLEGE,
GAYFIELD HOUSE, EDINBURGH, 1882

Front Row Seated.—Professor W. O. Williams; Professor A. N. McAlpine (Botany), and Professor W. Ivison Macadam (Chemistry).

Back Row Seated.—Professor James Hunter (Physiology); Dr. Steevenson Macadam (Chemistry); Professor W. Williams (Principal); Professor T. H. Lewis (Anatomy).

Standing.—Major Charles Phillips, V.O. attached to Cavalry Regiment at Edinburgh, and a clergyman friend of the College; J. A. Meredith and W. R. Davis within the doorway.

In January, 1904, with Colonel Richard Lawley, 7th Hussars, he proceeded to Canada and U.S.A., to prepare a scheme for horse purchase in the event of war. It was on this scheme that animals were bought during the Great War. He also visited Mexico to report on Remount possibilities in that country.

In November 1905, he again proceeded to India for a tour of five years, one of which was spent at Meerut. In 1906 he was promoted to the rank of Lieutenant-Colonel and appointed Inspecting Veterinary Officer, Eastern Command, India; in 1907 Deputy Principal Veterinary Officer at Army Headquarters, Simla.

Returned to England in 1910, and assumed duty as Assistant Director of Veterinary Services, Northern Command, York; was later transferred to the Irish Command in the same capacity, and held that appointment until December, 1913.

In December, 1913, was posted to the Aldershot Command as Deputy Director of Veterinary Services, and held that appointment up to August 4th, 1914. On August 5th, 1914, proceeded to France as Director of Veterinary Services of the British Expeditionary Force, in the rank of Brigadier-General.

After the conclusion of hostilities in France, Sir John was appointed Director of Veterinary Services in India, and left England in April, 1919, to take up that appointment. At that time trouble existed in Afghanistan, and along the North-West Frontier, and his first duty was to visit those regions to make dispositions with regard to veterinary services, particularly in respect of the control of rinderpest and foot-and-mouth disease amongst Army transport bullocks, also surra in camels. This entailed visits to military posts in the Kyber Pass, Kohat, Bannu, Waziristan and Quetta in Baluchistan. The conditions there pointed to the urgent necessity for the creation of an Army Veterinary Corps for India on a self-contained basis. At the request of the Commander-in-Chief, India, this was taken up, considered by the Advisory Council and approved by the Esher Committee who visited India for the purpose of reorganising the Indian Army. It was finally sanctioned by the Government of India Army Department under Army Instruction (India) No. 1007, dated at Delhi on December 14th, 1920.

Sir John was placed on retired pay on May 26th, 1921, being due for retirement on attaining the age limit of 57 years.

He was appointed Colonel Commandant of the Royal Army Veterinary Corps on June 27th, 1932, which appointment he held until he reached the regulation age limit, laid down by regulation for all Colonels Commandant, *viz.*, 70 years.

His record of active service is an experience shared by few soldiers. It began with the Suakim Expedition of 1896 and only terminated with the Afghan War of 1919, the intervening twenty-three years being varied by participation in such epics as the Relief of Mafeking and the entire span of the World War in France and Flanders.

In his varied services in war he was seven times mentioned in Despatches, once in the South African War of 1899-1902, and six times during the Great War. He also received successively the honours of C.M.G., C.B. and K.C.M.G., the latter carrying with it a Knighthood. The French decoration of Officer of the Order of the Legion d'honneur was also conferred on him.

In addition to the honours mentioned above, Sir John holds the following medals:—

Dongola Medal and Khedive's Star,

South African War—Queen's Medal and three Clasps,

Great War—1914 Star, British War Medal and Victory Medal.

Any appreciation of his career would not be complete without recording some of the many other incidents which stand to his credit.

Endowed with robust strength and untiring energy, his efforts to keep his branch of the Army at the highest level of efficiency and prestige have never flagged. A practical veterinary surgeon in every sense of the word, his wide clinical knowledge remains undiminished after years of administrative work, and he has ever encouraged specialisation. In the early years of his service he was quick to take advantage of the unusual opportunities that presented themselves of studying the horse resources of the world, a subject of which his knowledge is unrivalled to this day.

But it was the protracted struggle on the Western Front which provided the heaviest responsibilities and at the same time the greatest scope for Sir John's foresight, judgment and driving power. A few statistics indicate the unprecedented magnitude of his charge.

The Royal Army Veterinary Corps personnel under his command in that theatre of the Great War attained the colossal figure of 765 officers and 16,400 other ranks. The Veterinary Hospitals carried an average of 35,000 patients. Notwithstanding such vast issues, Sir John's mastership of detail was impressive beyond measure. He never failed in his memorisation of every officer's name and posting, and there were very few he did not know personally. He seldom worked less than 16 hours a day over the period of four years, and there were occasions when his apparent complete immunity from fatigue left the younger members of his staff feeling somewhat chastened at their own inferior powers of endurance. The darkest days of 1918 never impaired his cheerfulness nor his conviction that the Allies would prevail.

The phase of demobilisation brought yet another onerous task, as at the beginning of February, 1919, there remained some 200,000 animals

which were not required by the post-bellum Army. Their dispersal, which at that time was a matter outside the hands of the Veterinary Service, was falling behind schedule and the demobilisation of men was being delayed. This gave serious concern to the High Command, and Sir John advised that to expedite matters the task should be transferred to his Directorate; he undertook to dispose of not less than 100,000 animals before March 31st. His offer was accepted readily, though perhaps with more than a tinge of scepticism in some quarters. But his courage of conviction and confidence in the organisation which he had built up was vindicated amply, for by the date he specified he had disposed of, profitably to the State and with adequate safeguards against future mis-usage, no less than 150,000 animals. His wise policy and bold leadership had averted something which might well have proved catastrophic in its reverberations and had reaped a fourfold harvest. It had saved the consumption of thousands of tons of forage; it helped the French farmer to begin his efforts to restore his bespoiled lands; it put, approximately, 4½ million pounds sterling into our national exchequer, and made possible the speedier return to civil life of thousands of the troops.

Since his retirement, Sir John has served on various Councils and Committees, notably the Council of the Royal College of Veterinary Surgeons from 1922 to 1930; the Council of the National Veterinary Medical Association, of which he remains a member, while he has rendered long and yeoman service as Chairman of the Editorial Committee; the Committee of the Metropolitan Drinking Fountain and Cattle Trough Association since 1921; the Agricultural Research Council, the Economic Advisory Council (Cattle Diseases Committee); the Tuberculosis Committee of the Medical Research Council; and is one of the Governors of the Royal Veterinary College. On the formation of the National Horse Association he was elected a member of the Council and held the appointment of President in 1933.

At the last Council meeting of the Hunters' Improvement Society he was elected a member of the Council. He is also a member of the Shire Horse Society, the National Pony Society, and the Van Horse Parade, and Cart Horse Parade Societies.

In these days when no one seems to grow old, it is to be hoped that many years are left for him to pursue that ardent championship of the horse to which he generously devotes so much of his leisure.

A seventieth birthday is a memorable occasion in such a career, and to Sir John, on its attainment, to Lady Moore and their accomplished daughters, the profession extends its sincere felicitations.

The Veterinary Record

June 9th, 1934.

FOOD SELECTION

As is well known, under natural conditions of living, animals congregate where food is abundant and of the right quality, and when it ceases to be adequate movements take place to a more suitable environment; thus health and the power to procreate healthy offspring are maintained. Animals possess a natural or "instinctive" capacity to select the right foods for their needs. With their domestication came restriction in the use of this power, and not the least of the hardships imposed by man on the animals he has controlled for his own ends have been his ideas concerning the types of food desirable. In some instances this has had disastrous results, and notably has this been so in the case of pigs, poultry and dogs, as, for example, when attempts have been made to restrict their diets to cereals and cereal offals. Indeed, it is an astonishing tribute to Nature's power of adaptation that the domestic dog has survived such a radical—and irrational—alteration in his diet, for improvements in the compost of dog cereal biscuits are a very recent innovation. That many of the commercial dog foods are in themselves incomplete foods is known to be the case. Of particular interest in this connection is the investigation into the nutritive properties of certain dog foods carried out by Mrs. Kon, and which is reported elsewhere in this issue. Mrs. Kon's work provides definite proof of the care needed in the selection of a dog biscuit, particularly when it may form the principal dietary constituent. Given the opportunity to select his own food, one may assume that the dog would reject many of those thought to be suitable by his owner. Nutritionists cannot afford to neglect the natural requirements of domesticated animals.

The power possessed by animals to select food suitable for their needs is an interesting subject for study. It has, for instance, been shown that sheep are selective grazers, consuming pasture relatively rich in nutriment and neglecting that which is poorer. Cattle, as is well known, when grazing on phosphorus-deficient pasture eat the bones of cadavers. Calves and pigs when their diet lacks calcium will eat lime from the walls of their pens, and other animals may show a relish for urine and dried sweat for the sake of the chlorine content. Laboratory animals

used for nutritional experiments will eviscerate a dead cage companion and exhibit a definite predilection for certain tissues. It has been stated that if pigs are supplied with a diet containing the necessary minerals they refrain from rooting when put to pasture; it is doubtful, however, if this is the case because pigs do not turn the pasture over for the sole purpose of obtaining minerals, but because it is their instinct to do so in the search for their natural food—mice, voles, insects, worms, etc.

What is the governing power that induces animals to select certain foods? We have been in the habit of calling it instinct—which in itself requires definition—but a recent most interesting investigation carried out by Harris, Clay, Hargreaves and Ward would discredit the "instinct" hypothesis, and attribute food selection to something far more prosaic, educational experience. But this topic is too involved, and far too interesting, to be dealt with in a column or two. Veterinarians could supply much interesting information concerning food selection by animals, including evidence of misplaced confidence on the part of animals in the nutritive value of certain toxic leaves and fruits. The subject is well worthy of debate by our professional brethren; a text is to hand in the paper published by Harris and his colleagues.

"ANIMAL HOSPITAL" KEEPER FINED

As the result of a recent R.S.P.C.A. prosecution at Hendon Police Court, Harry Watson, of Whitchurch Lane, Edgware, the keeper of an "animal hospital," was fined 60s., with £5 5s. 0d. costs, for causing unnecessary suffering to a dog by unreasonably omitting to give it proper care and attention while in a suffering state.

Mr. Gordon Jones, who prosecuted for the R.S.P.C.A., described the defendant as a "quack veterinary expert," adding, "he is a man who holds himself out as able and willing to treat dogs for various ailments, with no professional qualifications whatever." The owner consulted a veterinary surgeon on March 4th, when the dog had a small inflamed patch on one leg. The dog was treated, and a dressing prescribed. Shortly afterwards she wanted to go away and, influenced by an advertisement, sent the dog to the defendant's establishment. Early in May the owner wished to ascertain the condition of the animal, and the defendant said it was in a very bad state and that the best thing would be to have it destroyed. Shortly afterwards she visited the home, and experienced some difficulty in seeing the dog. When it was produced it was found to be in a deplorable condition—weak, trembling and covered with sores. Upon professional advice, it was destroyed.

Expert evidence was given, indicating that, had the dog been properly treated, it could not have been in that condition. One of the professional witnesses stated that he was not aware that the Royal College recently brought an action against the defendant.

The defence was a denial of neglect.

Report

ECONOMIC ADVISORY COUNCIL: REPORT OF COMMITTEE ON CATTLE DISEASES

Summary of Principal Conclusions and Recommendations

We give below, preparatory to reviewing in detail (in succeeding issues) the contents of this Report, the principal conclusions and recommendations of the Economic Advisory Council's Committee on Cattle Diseases.

. . . . .

Principal Conclusions

THE PRESENT SYSTEM OF MILK PRODUCTION AND SUPPLY

(1) The dairying industry is of great economic importance, and the reduction of disease on a considerable scale would be a material gain for the nation (paragraph 11).

(2) The milking life of a dairy cow is only half that which might be expected under ideal conditions, with the result that there is an annual loss to the nation of over three million pounds. Fifty-eight per cent. of the cows passing out of herds are disposed of on account of disease, and the loss of many of the remainder is indirectly attributable to disease. The four principal diseases are bovine tuberculosis, contagious abortion, mastitis and Johne's disease (paragraphs 12-18).

(3) The proper feeding and care of dairy cattle are of the greatest importance, and Government should bring education to bear in this field. The chance that a cow will encounter infection depends on housing conditions, methods of management, and the extent to which cattle come into contact with animals from other herds. When cattle are bought into the herd, there is great risk of infection, especially when they pass through an open market. Herds and districts are specialised, to a greater or less extent, some in the production of milk and others in the rearing of young stock. This specialisation makes considerable movements of cattle inevitable (paragraphs 19-25).

(4) Milk reaches the consumer through a variety of channels. At one end of the scale there is the large concern in large towns that buys in bulk, and at the other the producer-retailer, selling direct to the consumer the milk that his own herd produces. Between these extremes there lie a number of intermediate types. The producer-retailer and the large distributor are in competition on the circumferences of the largest towns and throughout towns of large, but not the largest, size (paragraphs 26-28).

CATTLE DISEASES

(5) The incidence of bovine tuberculosis among cows is probably as high in Great Britain as anywhere else in the world. Cattle may be shown to be infected with it by their reactions

to tests with tuberculin. At least 40 per cent. of cows are infected with it in such degree that they will react to the tuberculin test. Infected cattle, even at an early stage of disease, excrete tubercle bacilli in great numbers. Calves born from infected mothers are nearly always free from the disease. Immunisation is not to-day of any importance in the control of tuberculosis (paragraphs 29-34).

(6) Cattle are probably infected with contagious abortion in as great numbers as with tuberculosis. The disease does not cause death, but is responsible for very serious loss to farmers by causing the loss of calves and of milk and by rendering animals sterile. Living animals may be shown by a blood agglutination test to be infected. Herds may achieve a comparatively high degree of immunity from this disease, either naturally or as a result of vaccination. Vaccination can usefully be adopted if the total eradication of disease by segregation is impracticable; but, if a living virus is used, vaccination should only be adopted in dealing with heavily infected herds (paragraphs 35-40).

(7) The incidence of Johne's disease varies greatly throughout the country. In some districts it is increasing and is causing considerable anxiety. It results in emaciation and, finally, in death. There is not yet a reliable agent for the diagnosis of the disease before clinical symptoms appear. There is no known cure (paragraphs 41-43).

(8) Thirty per cent. of the milking cattle in this country are probably infected with mastitis other than tuberculous mastitis. Chronic streptococcal mastitis is responsible for 90 per cent. of the cases. It gradually reduces the milk-producing powers of the infected animal (paragraphs 44-48).

DISEASES IN MAN ASSOCIATED WITH CATTLE DISEASES

(9) The diseases of dairy cattle which are dangerous to man are bovine tuberculosis, contagious abortion, which is responsible for undulant fever, and those forms of mastitis which may cause the epidemic diseases that are associated with streptococcal infection. Milk originally pure may convey disease as a result of subsequent infection (paragraph 49).

(10) Bovine tuberculosis is responsible for over 2,500 deaths annually among the human population in Great Britain, and for a still greater amount of serious illness. Most bovine tuberculosis in human beings is attributable to milk. At least five cows in every 1,000 yield milk infected with tuberculosis. As the result of the mixing of such milk with pure milk, over five per cent. of samples from individual herds are infected. A very much larger percentage of the milk conveyed in large containers is infected. The degree of infection of milk when retailed is affected by the extent to which it has been treated. In London, an investigation by the London County Council showed that 3·2 per cent. of samples of milk retailed are infected. In the four large cities of Scotland the corresponding percentage has been estimated at 5·26. The bulking of milk is more likely to increase than to decrease the risk of infection to man (paragraphs 50-57).

(11) Undulant fever, the disease associated with contagious abortion in cattle, is very rarely reported in Great Britain, though possibly the disease often passes unrecognised. Though it is important that farmers should not relax their efforts to reduce the extent to which their herds are infected with abortion, it is doubtful whether any measures that are practicable can be taken to reduce the incidence of undulant fever in man (paragraphs 58, 59).

(12) Approximately 100 outbreaks of epidemic disease, attributable either to mastitis among cattle or to subsequent infection of milk by those handling it, have been recorded in this country since 1903. The most important outbreak occurred at Hove in 1929, when 1,000 families were affected and 65 deaths occurred. The most common epidemic diseases carried by milk are scarlet fever, enteric fever, diphtheria, paratyphoid and septic sore throat. The reported outbreaks have not contributed much to the total incidence of the diseases in question, but the possibility that infection through milk is more extensive than appears from the outbreaks reported cannot be ruled out. The organisms responsible for these infections multiply rapidly in milk, and the bulking of milk contributes enormously to the chances of infection (paragraphs 60-62).

MILK IN HUMAN DIET AND THE EFFECTS OF PASTEURISATION ON IT

(13) Milk holds a unique position amongst the foods of animal origin, as it contains the three proximate principles of a diet, protein, fat, and carbohydrate, in addition to an adequate supply of inorganic constituents in such proportions as to be peculiarly adapted for the period of active growth. Cow's milk is not the ideal nutriment for the human infant, as milk secreted by the female of any species is peculiarly fitted for the rate of growth of the young of that species. Although mother's milk is unquestionably the best for the infant, cow's milk can be counted as a good substitute, provided that it is pure (paragraphs 63-71).

(14) The evidence available to-day leaves the conviction that any recognisable changes of quality induced in milk by pasteurisation rightly conducted are too small to outweigh the great advantage inherent in the protection from infection which the treatment secures and in the public confidence it inspires. It is sometimes suggested that there may be subtle changes not revealed in the state of present knowledge, but

policy should not be influenced by vague possibilities which established evidence makes improbable (paragraphs 72-98).

(15) Children reared on milk should be supplied with fruit juice, whether the milk is raw or pasteurised. The custom seems now to have become common, though not universal. Through the winter, it is also highly desirable that cod liver oil should be administered in small doses to children under twelve months reared on cow's milk (paragraphs 99-101).

ADMINISTRATIVE MEASURES IN FORCE IN REGARD TO CATTLE DISEASES AND THE MILK SUPPLY

(16) The tuberculosis order of 1925 requires that animals yielding tuberculous milk or showing clinical signs of tuberculosis should be notified to the local authorities, and by them slaughtered, subject to the payment of compensation. In recent years, the number of animals slaughtered under this order is between 15,000 and 19,000, and the compensation paid has amounted to between £60,000 and £70,000 a year, exclusive of the cost of administration (paragraphs 102-113).

(17) Under the epizoötic abortion order of 1922, certain specified precautions must be taken against bringing cows which have aborted into contact with other cattle. This order is generally considered ineffective (paragraphs 114, 115).

(18) The principal effect of the acts and orders affecting the production and sale of milk is to require that the milk of a cow recognised to be diseased should not be sold, to give power to local authorities to appoint veterinary inspectors, who must examine herds in certain circumstances, and to define special grades under which milk may be sold (paragraphs 116, 117).

(19) In Scotland, all dairy herds must undergo a clinical examination at least once every year, and in many parts herds are inspected three or even four times a year. In England and Wales the position is less satisfactory. Though in some counties routine clinical inspection is undertaken, this is not compulsory, and experience shows that the execution of the minimum requirements of the order does not reduce the degree to which milk is infected with tuberculosis (paragraphs 118, 119).

(20) There are four kinds of milk officially recognised under the milk (special designations) orders, namely:—

(a) certified milk, or milk from herds free from tuberculosis, which is bottled on the farm;

(b) grade A tuberculin-tested milk;

(c) grade A milk;

(d) pasteurised milk (paragraph 120).

(21) Less than 1 per cent. of dairy cows are in herds officially recognised as being free from tuberculosis. The sale of designated milk as such is far below the supply and shows no sign of expansion (paragraph 121).

(22) The measures discussed have not appreciably reduced the incidence of tuberculosis among dairy cattle. Infected cows are removed too late to prevent the infection of other cattle or appreciably to improve the purity of the milk supply. At the price at which it is placed on sale, there has been little demand for graded milk from tuberculin-tested herds (paragraphs 122-124).

POSSIBLE LINES OF ADMINISTRATIVE DEVELOPMENT

(23) The three principal proposals promising an improvement of the milk supply are:—

(i) an extension of routine veterinary inspection;

(ii) an active policy for the eradication of bovine tuberculosis;

(iii) the grant to large urban authorities of the right to require pasteurisation of milk other than that produced from herds free from tuberculosis (paragraph 126).

THE FURTHER DEVELOPMENT OF THE VETERINARY INSPECTION OF DAIRY CATTLE

(24) Though clinical inspection reduces the amount of tuberculous milk passing into consumption, it can never render the milk supply safe as—

(i) some cows showing no clinical symptoms yield tuberculous milk;

(ii) cows reach the stage of giving tuberculous milk between the visits of the inspector;

(iii) milk is often contaminated with tubercle bacilli present in infected dung or dust.

Experience shows that clinical inspection cannot be relied on to reduce infection to really small proportions, though it has not yet been sufficiently developed to show how effective it might be in this direction (paragraphs 127-132).

(25) A reduction in the infection of milk with bovine tuberculosis is not accompanied by a proportionate reduction in the infection in man, and the results of clinical inspection may prove disappointing from this point of view. Routine clinical inspection will not greatly reduce the incidence of bovine tuberculosis by removing infected cows from herds, but it will improve the day-to-day management of herds, awaken farmers to the necessity of eradication and benefit country as well as town populations (paragraphs 133-136).

METHODS OF ERADICATION

(26) The total eradication of bovine tuberculosis from all herds is the only complete solution of the problem of tuberculous milk. Self-supporting herds may be cleared by the isolation

or elimination of infected cattle; but most herds are not self-supporting, and some special provision must be adopted for them. The specialisation of herds for breeding and milk production respectively is economically advantageous and firmly established and cannot be reduced. A campaign based from the beginning on progressive formation of clean areas would require compulsion at the outset and would greatly interfere with the free flow of cattle on which our whole cattle industry is based, and cannot now be undertaken (paragraphs 137-142).

(27) It is therefore essential to prevent the infection in transit of tuberculosis-free cattle. The practical difficulties involved will be considerable, but not insuperable (paragraph 143).

(28) Farmers may reduce tuberculosis in their herds by the slaughter, the segregation, or the sale of reacting animals. Any organised scheme must permit the sale of reacting animals without declaration that they have reacted (paragraphs 144, 145).

(29) The general immunisation of cattle against tuberculosis is unlikely to be a satisfactory alternative to eradication and is incompatible with it (paragraph 146).

(30) Every attempt on the part of individual farmers to eliminate disease from their herds should be encouraged and, where possible, helped; but a concerted scheme based on official regulations should not apply to more than one disease at a time. The first disease to be dealt with officially must be tuberculosis, because of its great danger to public health (paragraphs 147, 148).

THE PASTEURISATION OF MILK

(31) Much milk consumed in large towns is already heat-treated to prevent souring. The pasteurisation of such milk could be required without great interference with the interests of individuals. But the interests of the individual would be seriously affected by the compulsory pasteurisation of all milk at present sold in a raw state (paragraph 149).

(32) There is not sufficient evidence to support the presumption that pasteurisation is harmful from the point of view of human nutrition. It cannot make dirty milk clean and, therefore, would not discourage farmers from producing clean milk. If correctly introduced, it would encourage them to undertake eradication. On the other hand, the compulsory pasteurisation of milk would disturb the balance at present existing in large towns between the producers of milk in comparatively distant areas for sale after heat-treatment, and the producers of milk in the immediate neighbourhood of large towns for sale in a raw state (paragraphs 150-155).

(33) Pasteurisation is incompatible with the business methods of producer-retailers and, if made compulsory at once, a large number of them would be deprived of their present means of livelihood (paragraphs 156, 157).

(34) No policy at the outset satisfies both the interests of public health and those of producer-retailers near large towns. Clinical inspection is not a satisfactory alternative to pasteurisation in those areas where the latter is practicable, nor could producer-retailers make their milk safe by the eradication of tuberculosis until this has made considerable progress in the breeding areas. But, as soon as a sufficient supply of clean cows can be created to enable producer-retailers to free their herds from tuberculosis, it will be fair to make them choose between doing so and submitting to pasteurisation (paragraphs 158-160.

(35) Though most milk sold in large towns undergoes some form of heat-treatment, the bulk of it is at present treated in unlicensed plants. Milk thus treated, and pasteurised milk, are often sold without any indication that they have been treated. Inspection of licensed plants is at present unsatisfactory, and milk sold both from licensed plants (pasteurised milk), and still more that from other plants, is often tuberculous. No milk should be permitted to undergo any form of heat-treatment which is not approved by the Ministry of Health or the Department of Health for Scotland. All pasteurised and sterilised milk should be sold as such, and the plants in which it is pasteurised or sterilised should be of approved design and regularly and efficiently inspected. In the day-to-day working of commercial plants a full laboratory standard of exactitude must be maintained (paragraphs 161-163).

THE INTER-RELATION OF THE VARIOUS POLICIES ADVOCATED

(36) The veterinary service should be expanded as the first part of a programme for the eradication of bovine tuberculosis and the control of other diseases (paragraph 164).

(37) Substantial inducements should be offered to farmers in the form of a higher price for the milk they sell, to incur the costs of eradication, which at the outset may be heavy. A levy should be made on the milk industry to provide a bonus for milk sold from non-tuberculous herds, through the machinery of the Milk Marketing Boards. The collection of this levy should be made a statutory obligation of the present Milk Marketing Boards or of any organisation which may replace them (paragraphs 166, 167).

(38) A satisfactory standard of cleanliness should be insisted on universally, so that the advantages of price owing to grading would be confined to milk which is safe (as distinguished from clean). In this way the inducement to produce tuberculosis-free milk would be increased (paragraph 168).

(39) The measures which we recommend for the registration of tuberculosis-free herds should be put into operation before the choice between the alternatives of pasteurisation or the eradi-

cation of tuberculosis is placed before producer-retailers. In order to enable a reservoir of tuberculosis-free cattle to be built up, a reasonable period should be allowed to elapse before pasteurisation is anywhere made compulsory (paragraphs 169, 170).

(40) Our recommendations are made on the hypothesis that a policy of eradicating tuberculosis from the dairy herds of this country is pursued vigorously (paragraph 171).

. . . . .

Recommendations

VETERINARY INSPECTION

(1) Routine veterinary inspection should be made obligatory for all local authorities. The veterinary service should be expanded under the immediate control of local authorities, but with precautions designed to secure to the departments of agriculture the power to co-ordinate the activities of local authorities (paragraphs 172-174).

(2) The chief veterinary officer should only be appointed or dismissed by the local authority with the approval of the departments of agriculture. Eventually, all veterinary officers in public employment should be required to have taken a diploma in veterinary state medicine (paragraphs 175-177).

(3) The veterinary officers of local authorities who are responsible for veterinary inspection should also be responsible for duties in connection with eradication (paragraph 178).

(4) Close co-operation should be established between the veterinary service and the sanitary authorities. But the functions of sanitary authorities under the milk and dairies orders should not be diminished (paragraph 179).

(5) Certain boroughs, other than county boroughs, are constituted local authorities under the diseases of animals acts. Their duties in this connection should be transferred to the appropriate county councils (paragraph 180).

(6) The testing of herds with tuberculin for the purposes of the milk designations order should be transferred to the expanded veterinary service. The granting of licences for the production of designated milk should also be made a function of county councils (paragraphs 181, 182).

(7) Only whole-time officers should be employed in the veterinary service, except where, by reason of the difficulty of securing adequate veterinary facilities, the agricultural interests of the district would be likely to suffer if a whole-time officer were appointed. The employment of part-time veterinary officers should also be permitted as a temporary measure during the period of expansion (paragraph 183).

(8) A full veterinary service with the above duties cannot be established immediately, as it would require about 300 veterinary surgeons. Steps should be taken to provide these (paragraphs 184, 185).

A SCHEME FOR THE ERADICATION OF BOVINE TUBERCULOSIS

(9) The scheme for the eradication of bovine tuberculosis will require the active supervision of the Ministry of Agriculture, and should provide for:—

(i) the institution of a list of tuberculosis-free herds (accepted herds), tested with tuberculin from time to time under official supervision, and declared to be free from bovine tuberculosis;

(ii) the provision of free advice and free tuberculin-testing for owners of herds who agree to make *bona fide* efforts to free their herds from tuberculosis, or who have established free herds;

(iii) financial help, where necessary, by way of loans or the guarantee of loans, to approved owners for the purpose of undertaking expenditure required by the veterinary inspector as necessary to eradication;

(iv) the securing to owners of disease-free herds of a higher price for their milk than that obtained by other owners;

(v) the taking of administrative measures designed to secure that tuberculosis-free cattle from accepted herds should be moved about the country and exposed for sale without running the risk of being brought in contact with other cattle;

(vi) the adjustment of regulations governing the production of graded milks and the grades of milk officially approved, and the making of regulations relative to the compulsory pasteurisation of milk with a view to increasing the incentive to farmers to eradicate tuberculosis from their herds (paragraphs 186-204).

(10) The functions to be performed in England and Wales in regard to eradication by the Ministry of Agriculture should in Scotland be performed by the Department of Agriculture for Scotland (paragraph 205).

REGULATIONS GOVERNING THE GRADING OF MILK AND PASTEURISATION

(11) All milk sold for consumption in liquid form should be required to be sold under an official designation. The designation of the milk should be clearly marked on the vessel in which it is sold to the public, a distinctive colour being prescribed for marking each designated milk. No liquid milk should be sold that does not attain a fixed standard of cleanliness, or pre-pasteurisation standard, at the farm. This standard should approximate to that at present required for grade A milk. In addition, all milk should conform to the definitions of one of the following designations:—

(i) *Certified milk*, namely, milk which has not undergone any process of heat-treatment and is derived from tubercle-free herds.

(This milk should not be required to be bottled on the farm).

(ii) *Pasteurised milk,* namely, milk which has undergone, once only, a process of heat-treatment approved for this purpose by the Ministry of Health or the Department of Health for Scotland, and has undergone no other process of heat-treatment. Pasteurisation should be permitted only in a plant licensed for the purpose.

(iii) *Sterilised milk,* namely, milk which has been raised to the boiling-point or higher in a plant licensed for the purpose, and which has undergone no other process of heat-treatment.

(iv) *Milk (uncertified),* namely, milk which has undergone no form of heat-treatment and is not derived from tuberculosis-free herds, but which attains a certain hygienic standard (paragraphs 206, 207).

(12) No milk which has been held in any vessel containing more than 100 gallons of milk, unless derived from a single herd, should be sold for consumption in liquid form unless it has subsequently been pasteurised (paragraph 208).

(13) The council of any county borough, municipal borough, large burgh, or urban district in an area, the population of which exceeds 100,000, and the London County Council should have the right to prohibit the sale of milk (uncertified), as defined above after a date which shall not be earlier than five years after the initiation of the scheme of eradication, provided that it has given not less than two years' notice of its intention to do so (paragraph 209).

(14) The pasteurisation of milk to be sold under the order should only be permitted in plants the design of which has been officially approved, which have themselves been tested on erection to ensure that they conform to the approved design, and which are frequently inspected during working by an officer of the sanitary authority, who should apply prescribed tests and record the results at each visit. The authority responsible for approving the design of plants should act only after consulting the National Physical Laboratory (paragraphs 210-212).

RECOMMENDATIONS IN REGARD TO DISEASES OF CATTLE OTHER THAN TUBERCULOSIS

(15) The departments of agriculture should arrange that facilities for testing milk samples for the chronic streptococcal form of mastitis should be available for farmers through their own veterinary surgeons in return for the payment of a fee to cover the cost (paragraphs 213, 214).

(16) The programme of research into Johne's disease of the Agricultural Research Council should be vigorously pursued (paragraph 215).

(17) The committee of the Agricultural Research Council on *Brucella abortus* infection should be given every possible facility, through the Agricultural Research Council, for the early completion of their programme (paragraphs 216, 217).

MISCELLANEOUS RECOMMENDATIONS

(18) The departments of agriculture should invite the Milk Marketing Boards to adopt the principle that their funds should be expended on research in regard to dairying and animal diseases, only after consultation with, and with the concurrence of, whichever is the appropriate council of the three research councils (paragraph 218).

(19) The Ministry of Agriculture should approve a standard for tuberculin of prescribed potency and purity, and should provide that it should be sold only to qualified veterinary surgeons (paragraph 219).

(20) The police, and the sanitary officers of local authorities and all veterinary officers in public employment should be given the right of access to dealers' and knackers' premises, and the right to require information upon the source from which cattle are received and the destination to which cattle and carcases are despatched (paragraph 220).

THE FINANCIAL EFFECT OF THE MEASURES RECOMMENDED

(21) The burden of the new expenditure recommended should be divided between the farming community, the milk industry as a whole, and those who contribute, either as taxpayers or ratepayers, to national and local funds, on the following basis:—

(a) The farming community would be responsible for the costs incurred in eradication, with the exception of the costs of tuberculin testing and general veterinary advice. The state or the local authority, however, would, in cases of necessity, make advances to meet this expenditure, repayable over a reasonable period.

(b) The milk industry as a whole would be responsible for finding the sum required to pay the bonus on milk produced in accepted herds.

(c) The costs of the increased veterinary services and laboratory work and of free tuberculin testing would be met from national or local funds. Loans to farmers for the purpose of eradication would either be made from the same source, or under the guarantee of the state or local authority (paragraphs 221-224).

(22) The state should not continue to bear the cost of compensating the owners of tuberculous animals slaughtered under the tuberculosis order. The end of compensation should coincide with the grant by the government of substantial help in the eradication of tuberculosis. In view,

however, of the present crisis in the dairying industry, it may not be practicable to take this step immediately (paragraph 225).

(23) To assist the expansion of the veterinary service, the Exchequer should make a contribution to local authorities apportioned among the various counties in such a way that those on which the burden would be most severe would benefit the most (paragraph 226).

(24) Local authorities should be entitled to recover either the whole, or at least a substantial part, of the cost of providing free tuberculin testing from the Exchequer (paragraph 227).

(25) There should be no loss to the authority making or guaranteeing loans to farmers for eradication. But, if such a loss should occur, it should be appropriately divided between the local authority and the Exchequer (paragraph 228).

(Signed) F. GOWLAND HOPKINS, *Chairman.*
MERRIK R. BURRELL.*
E. P. CATHCART.
A. STANLEY GRIFFITH.
C. HARRIS.†
J. HARRY JONES.
JOHN MOORE.‡

(Signed) FRANCIS HEMMING, P. K. DEBENHAM } *Joint secretaries to the committee.*

April 16, 1934.

* Reservation by Sir Merrik Burrell (page 99).
† Addendum and reservation by Sir Charles Harris (page 102).
‡ Addendum by Major-General Sir John Moore (page 108).

Clinical Communications

NOTES ON ARSENICAL POISONING IN CATTLE

R. A. S. MACDONALD, B.Sc., M.R.C.V.S.
and
H. S. PURCHASE, B.Sc., F.R.C.V.S.
NORTHERN RHODESIA

In a country such as Northern Rhodesia, where the periodical dipping of cattle in an arsenical wash is a routine practice, it is only to be expected that cases of arsenical poisoning will occur from time to time. It would appear that the incidence of these cases is on the increase. This is probably due to familiarity with arsenic breeding contempt of its poisonous properties and also, we are afraid, to a greater appreciation by the unscrupulous of the potentialities of arsenic as a medium of malicious destruction of cattle. Within the last two years, in Northern Rhodesia, where a very extensive and serious locust invasion is in progress, a new class of cases of arsenical poisoning has arisen—cases caused by the ingestion of locust poison from areas which have been sprayed for the destruction of locust "hoppers."

It must be definitely stated that the process of dipping cattle in any of the recognised proprietary arsenical dipping fluids, when carried out according to directions, by a careful individual, is attended by practically no risk. As evidence of this one quotes the case of the dipping of cattle in certain Native Reserves, directly controlled and operated by Government, in which during the year 1932, there was a total of 765,000 immersions with only six accidents in any way attributable to the process of dipping. This represents a percentage of ·0008.

A very serious outbreak of arsenical poisoning involving the death of 26 head of cattle occurred on a Government Station in Northern Rhodesia in 1932. From the circumstances of the case one was left in no doubt that the arsenic was maliciously administered to the cattle and that the operation of dipping or the careless disposal of arsenical residues could be definitely ruled out. Unfortunately, very careful enquiries by the Criminal Investigation Department failed to reveal the culprit.

On a Sunday morning, eight head of cattle were found dead in a paddock and all the animals in that paddock (a total of 32) were sick, exhibiting symptoms of acute abdominal pain, purging (no blood) and stercoraceous nasal discharge. There was no scalding of the skin.

Post-mortem examinations were performed immediately; the possibility of anthrax, etc., was eliminated and qualitative tests for the presence of arsenic in the stomach contents were performed. The latter were positive. By this time ten animals were dead. The *post-mortem* appearances were absolutely uniform in each case, suggesting that the arsenic had been ingested in approximately equal quantities and at the same time. The salient lesions were:—

(*a*) Externally: signs of purging, sunken eyes, stercoraceous nasal discharge.

(*b*) Internally: gastric mucosæ peeled off easily, inflammation of the œsophageal groove, peracute inflammation of the abomasum, slight enteritis, watery ingesta in the cæcum, inflammation of the rectum. Heart in full distension, petechiæ in left ventricle. Lungs—congested, froth in all bronchi. Trachea—mucous lining much inflamed. Blood—dark in colour and imperfectly clotted. (In the animals which died later the abomasal mucosa was ulcerated and the enteritis was more pronounced).

The remaining 22 animals were brought into stabling and treated immediately with antidotes to arsenic, demulcents and stimulants. Liquor ferri perchlor., sodii carb., ol. lini., milk, brandy, etc., were employed.

Ten more cattle were dead on the second day (Monday) and three on the morning of the third day (Tuesday), despite continued antidotal treatment. Three more died during the night of Tuesday-Wednesday; making a total of 26. The remaining six affected animals recovered.

Meantime the paddock implicated had been explored. Its proximity to a disused dipping tank made one suspicious that the soil might have become contaminated by a possible overflow of dip wash. There had been no rain for over four days, however, and the possibility of an overflow was very remote. The cattle could have had no access to the dipping tank. Soil samples were taken at points which would have been affected had an overflow occurred. They were tested for the presence of arsenic and proved negative. Samples from the surface of an ant heap which had been licked by the cattle were also negative.

Suspicion naturally fell upon the watering trough. A sample of water from the trough showed a very strong positive reaction, while a sample taken from the tap running into the tank was quite negative.

The subsequent report of an analyst on a sample of water from the tank stated: " The sample of water received was perfectly clear, with a small amount of flocculent sediment. The clear liquid on evaporation gave a whitish residue which was decidedly alkaline and amounted to 710 parts per million. The arsenic content was found to be equivalent to 95 parts of arsenic trioxide per million of water and this would correspond to about half a pound of arsenic trioxide in the 500 gallons of water contained in the tank." Further tests were made to determine whether the probable source of the arsenic was locust poison or cattle-dip and these furnished strong presumptive evidence that the former was the more likely agent.

Samples of the ingesta of 17 of the cattle were analysed by Mr. H. B. Stent, B.Sc., A.I.C.T.A. The method employed was that devised by H. H. Green (1919—" The Micro-Titration of Arsenic "—5th and 6th Reports, Director of Veterinary Research, Union of South Africa, pp. 539-550—Government Printer, Pretoria), and the results were as under:—

No.	Concentration As_2O_3.
1	1 in 22,000
2	1 in 96,000
3	1 in 53,000
4	1 in 19,000
5	1 in 54,000
6	1 in 23,000
7	1 in 22,000
8	1 in 60,000
9	1 in 34,000
10	1 in 63,000
11	1 in 47,000
12	1 in 48,000
13	1 in 52,000
14	1 in 100,000
15	1 in 100,000
16	1 in 38,000
17	1 in 40,000

Average of 17 cases: 1 in 51,000.
(Standard Deviation 1 in 26,500).

The routine qualitative test employed in Northern Rhodesia for the detection of the presence of arsenic is a modification of the Gutzeit Test.

The antidotal treatment for arsenic poisoning in cattle consists of two solutions:

Solution No. 1: one ounce of sodii carb. in twelve ounces of water.

Solution No. 2: three ounces of liquor ferri perchlor., in ten ounces of water.

The two solutions are mixed in an open vessel (a reaction occurring), filtered into a bottle and administered immediately. A large dose of magnesium sulphate is given two to three hours later.

The locust poison previously referred to consists of pure sodium arsenite with about 19 per cent. caustic soda added. This is used, for spraying locust " hoppers," in the proportion of five ounces of poison to four gallons of water. There is evidence that the taste of the poison is attractive to cattle.

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JOHNE'S DISEASE

ARNOLD SPICER, F.R.C.V.S.
Crabwood, Oxted

About four years ago in a herd of Guernseys twelve cows had died from Johne's disease over a period of eighteen months, and since then the disease has died out until there have been no losses for the last two years.

During all that period the cattle were fed on cake containing an exactly balanced ration of minerals, as far as the cake was concerned, and each cow was given four pounds for every gallon of milk produced and ten to twelve pounds of hay. The hay reduced the quantity of minerals to below the actual requirements of the cattle and, added to this, the cattle received no cake during the summer months—therefore no minerals. In spite of this the minerals cut down the losses from Johne's disease to nil.

Permission was obtained to test this herd and by the kind courtesy of Professor Buxton I was able to do it with synthetic johnin (I have always considered it to be a waste of time to test with concentrated johnin, as the non-specific reaction makes it too difficult to read the test correctly).

Thirty cows were tested. Four reacted and the rest passed in a most satisfactory manner. One animal that failed was a heifer that had only

been in the herd for two months and had not received minerals until she came into the herd, so for the purposes of this test she can be put on one side. Therefore three cows failed out of twenty-nine in a herd which four years ago was riddled with the disease, and in which the supply of minerals was obviously deficient.

Synthetic Johnin.—The reaction shown by the four cows to this test was a typical diffuse swelling, thickest in the centre and shading off until it disappeared in the surrounding skin; calipers were quite unnecessary as the reaction was obvious directly one touched the skin. The animals that passed did so very definitely and there was not the slightest reason to hesitate about a decision. There was no nodule or any sign of a non-specific reaction.

The reaction is definitely not so marked as the tuberculous reaction with synthetic tuberculin; but one does not expect that with johnin. In this case 16 was the highest measurement but with the tuberculin it is frequently 20 and 30. Of course the number of animals tested is small, but compared with the use of synthetic tuberculin, of which I have used a fair quantity, this promises to be an extremely useful test.

I hope soon to obtain permission to test a herd in which Johne's disease was rampant four years ago, since when it has been fed heavily with minerals and the result has been that no cow has died from the disease since the minerals were started. This should tell us definitely whether or not minerals can prevent Johne's disease.

TWELFTH INTERNATIONAL VETERINARY CONGRESS

British National Committee Fund

Donations (to June 4th)

	£	s.	d.
Previously acknowledged (*Veterinary Record*, May 5th)	431	4	0
Divisions, N.V.M.A.			
South Eastern Division	5	0	0
North of England Division	3	0	0
North Wales Division	2	0	0
	£441	14	0
Members.			
G. T. Matthews	1	1	0
G. Mayall	1	1	0
F. C. Scott	1	1	0
	£444	17	0

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Veterinarians attending the Congress from this country, while they will make their arrangements through the official travel agents—The American Express Company—are requested to inform the Hon. Secretary of the British National Committee, N.V.M.A. Offices, 2, Verulam Buildings, Gray's Inn, W.C.1, of their intention to participate in the Convention, at the same time intimating which, if either, of the post-Congress tours it is their intention to take (we understand that a number of members have booked for Tour No. 2). For their information, we reproduce below the (amended) particulars concerning costs, steamship and hotel accommodation.

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Synopsis of Cost

	£	s.	d.
1. Steamship Passage, round-trip ...	53	0	0
2. American Visa—$10.00—approx.	2	0	0
3. Head Tax (returnable on leaving U.S.A.)	1	12	0
4. Hotel—Waldorf Astoria: 6 days at $4.00 per day—$24.00 ... ... approx.	5	0	0
5. Meals—Waldorf Astoria: 6 days at $2.35 approx. per day $14.10 ... ... approx.	3	0	0
6. Itinerary No. 2 $224.00 approx.	43	10	0
Total ...	£108	2	0
If Itinerary No. 1 is taken:— Approximate cost	£92	12	0

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STEAMSHIP ACCOMMODATION

The Cunard Line have been designated as the official steamship line for the British participants.

Westbound:

The S.S. "Scythia" has been selected as the boat to carry the party westbound. Leaving Liverpool August 4th and arriving in Boston August 12th, entraining for New York, arriving that evening.

Eastbound:

Persons taking Itinerary No. 2 after the Convention will complete their trip and may embark at Boston on September 1st on the S.S. "Laconia" for Liverpool.

Persons taking Itinerary No. 1 after the Convention will complete their trip and embark at New York in either the S.S. "Olympic" of the White Star Line on August 29th for Southampton, or on the S.S. "Laconia" of the Cunard Line on August 31st for Liverpool.

Rates:

The minimum round-trip rate, Cabin Class, Westbound S.S. "Scythia" and East-bound S.S. "Laconia" is £53. Superior accommodation may, of course, be reserved at a slightly higher rate.

Rail fare from home town to Liverpool is not included in the cost of the steamship ticket.

HOTEL ACCOMMODATION

The Waldorf Astoria Hotel, which will be the official headquarters of the Congress, has placed at its disposal a most acceptable arrangement. Special rates will be in effect for members of the Congress. This hotel is the largest and best equipped hotel in the world. All the meeting rooms are cooled by artificial refrigeration during the summer.

Rates for Rooms:

Single.—$4.00 per day.

Double.—$3.50 (twin beds) per day per person.

Each room is equipped with private bath.

The restaurant facilities in the most moderately priced of the three dining rooms at the Waldorf Astoria, *viz.*, "The Savarin" make it possible for one to dine well at a reasonable rate; breakfast, luncheon and dinner may be obtained for as little as $2.35. This makes it possible to keep the expenses for room and meals under $6.50 per day.

In the event that visitors desire a lower rate, arrangements have been made for accommodations at either the Lexington or the Montclear Hotel, both of which are near the Waldorf Astoria. The rate per person per day is $2.50.

The American Express Company will have a desk at the Waldorf Astoria with a representative to assist in any way possible.

Passports and Visas.—All delegates or visitors to the Conference will be required to have a passport. An American visa (cost $10.00) will also be necessary. It will be necessary for the delegate or visitor to apply in person to the nearest American Consul to obtain this visa.

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Chicago and its "World's Fair"

Whether or not those from overseas who attend the Twelfth International Veterinary Congress in New York City next August can spare the time, and perhaps the funds, required for a tour of America, it will be a grave mistake to omit a visit to Chicago. Chicago, as travelling is done in America, is but a short trip from New York. Although 900 miles west of the latter city, it is in the eastern third of the United States. The trip is not expensive and requires but 18 hours by train and five hours by airplane —which latter, by the way, is a less expensive way of travelling in America than it is in Europe. The trip takes one through the beautiful Appalachian Mountains, which, while perhaps not much as mountains go, are nevertheless interesting and enjoyable. Washington and the government departments, Detroit and its great automobile factories and Niagara Falls may be visited *en route* without extra cost.

Chicago is the veterinary centre, as it is the medical centre, the educational centre, the railroad centre, the air transport centre and the meat packing centre of the United States. In it live and work more veterinarians than in any other city. There the headquarters of the American Veterinary Medical Association are located and there all national veterinary magazines are published. The Union Stock Yards in Chicago handle a far greater number of animals daily than any other market and the Chicago packing houses have a capacity far exceeding that of any other packing area. More than a hundred veterinarians are engaged in meat inspection at these establishments. They offer much of interest and afford not a little of an instructional nature to any veterinary visitor, but of course the outstanding attraction of Chicago to any visitor during 1934 will be its World's Fair, known as "A century of Progress Exposition."

A thousand articles of the length of this one would be totally inadequate for the description of this fair. The exposition opened a year ago to commemorate the 100th anniversary of the founding of Chicago, and when it closed, having been visited by over 22 million people, a universal demand arose for its repetition this year. No other world's fair has ever approached this in the number of visitors attracted, except the Columbian Exposition in the same city 40 years ago, and even that did not equal it.

The Century of Progress Exposition portrays the development of science, art and industry—of human progress not only for 100 years, but since the dawn of civilisation. Here are shown, in 140 linear miles of exhibits covering 487 acres of Chicago lake front, the marvels of chemistry and electricity and steam, of transportation and manufacturing, of sociology and medicine and astronomy and physics, of religion and government, of mines and mills and farms and forest, and every human activity from its crude beginnings through its evolution to its present condition. Surely a trip to America in 1934 will be incomplete without a visit to this exposition, the like of which the world never before has seen.

On account of the World's Fair, the railroads will offer reduced rates from New York to Chicago and return, after June 1st. Last year the fare was $33.00; it is expected that this year the rate will be $27.00. Motor coach fares (the trip requires 30 hours each way) are approximately half the railway rates.

The Organising Committee of the Congress is planning a conducted tour to Chicago following the Congress, but, at the time of writing, the plans are not sufficiently mature to enable the announcement of details or even that the tour certainly will be made—this will depend in part on how many of the foreign delegates desire to participate in such a tour. The tour, if made, will be very inexpensive for visiting delegates: possibly limited to living expenses.

IN PARLIAMENT

Minister of Agriculture and the Milk Scheme

When, on Thursday of last week, the House of Commons went into Committee on the financial resolution in connection with the Milk Bill, Mr. Elliot, Minister of Agriculture, said that they were dealing with the financial resolution of a Bill which would shortly be introduced to deal with the milk situation and certain reforms which it was advisable to bring about in the production of milk in this country. These measures would vitally affect one of the greatest of British industries, whether they regarded that industry from the point of view of the sums of money involved, the number of persons engaged in it, its significance to the health of the nation, or its Imperial and international repercussions. The annual value of the products with which they were about to deal was approximately £63,000,000, which was £11,000,000 more than the total electricity supply revenue of the country. There were 3,400,000 dairy cows, and the number of persons engaged in the industry was estimated at 320,000, which was more than the total of those engaged in the woollen and worsted trades, and even more than the combined figure for electrical engineering and shipbuilding.

It was clear, then, that the preservation of this industry was of the greatest importance. . . .

The general policy of the Government was to secure a bigger consumption of milk, the cleaning up of the herds, and taking such prompt steps as would not allow the industry to collapse while the House was considering the ideal conditions under which milk should be produced in this country. They therefore had to consider a short-range and a long-range policy, the short-range policy being immediate measures for the manufacture of milk products, and the long-range for cleaning up the herds, a campaign of publicity, and increasing milk consumption. They had chosen the line of ensuring organised milk producers against the effect of present low values for milk products, which were due to heavy importations, and in some cases to depreciated currencies as well. Minimum prices of 5d. and 6d. would be guaranteed. There had been suggestions that it was a mistake to use public funds for assisting cheese-making, and that the money would be better utilised by providing for the greater consumption of milk in the schools. (Hear, hear.) That course, however, would be inadequate to deal with the situation. . . .

The resolution provided the money to launch a campaign for securing a purer milk supply. Whatever might be the merits of pasteurisation, a universal compulsory scheme was at present impracticable. The total eradication of tuberculosis from all herds was the only complete solution of the problem of tuberculous milk. That solution could not be obtained for many years and without considerable expenditure, but the Government proposed to use £750,000 primarily for making a start on the problem. It was true that the present condition of dairy herds was a reproach to the country. In the existing financial circumstances of the milk boards and the producers, it was impossible to expect them to bear the cost of a scheme for the establishment of tuberculosis-free herds, but it was essential that continuity should be guaranteed to the scheme, and the Bill would enable Ministers concerned to require the boards to make provision for the continuance of the campaign without further assistance from the Exchequer.

Increasing the Demand

The resolution also authorised the contribution of £1,000,000 from the Exchequer, on a pound-per-pound basis, over a period of two years for the purpose of increasing the demand for milk. The milk marketing boards, who would contribute the other pound, would be required to submit schemes for the approval of the Government, and the grant would only be available for approved schemes. A programme would not be approved unless it contained provision for the supply of milk to schools at reduced rates.

All this would take time, and the crisis upon them now must be handled. Therefore they were thrown back on the first part of the resolution, without which it would be impossible to hope for success in the other campaigns. That part sought authority for the payment to the milk marketing boards for two years from April 1, 1934, of such sums as may be required to raise the value of milk manufactured into certain commodities to a minimum of 5d. a gallon in summer and 6d. in winter, standard price. . . .

In the course of subsequent discussion, Mr. J. de Rothschild said that there could be no doubt that money which was spent on the consumption of milk might produce an economy later on in the health services themselves. The question of milk provided in the schools should be given more attention. The success of these measures ultimately would depend on the industry, which must be able to provide an adequate supply of high-class milk at a reasonable price. The standard of purity of milk must be improved, but pasteurisation must never be regarded as a substitute for pure unprocessed milk. (Hear, hear.) Large-scale experiments on the relative value of pasteurised and raw clean milk could be carried out in the schools. At present there was an outcry that all the milk which was given to school-children was pasteurised milk, and part of it at least should be ordinary tuberculin-tested milk.

Colonel Ruggles-Brise said the proposals of the Government would be welcomed not only by the milk industry, but by agriculturists generally. The Government had introduced a policy of "three p.'s," embracing steps to deal with questions of plurality, purity, and publicity in relation to milk supplies. The home market was large enough to consume all the milk produced, and the present difficult situation had been created by a plurality of supplies caused by exceptionally heavy imports. The Government proposed to meet that by giving a subsidy, but a subsidy alone would do nothing to deal with superfluous imports of milk and milk products which had squeezed the home producer out of business.

Captain Heilgers said that the doctors had done a great deal to kill the production of clean milk in this country. If they had only said that milk was definitely slimming there would have been another tale to tell. (Laughter.) Unfortunately they had gone out for pasteurisation and had played into the hands of the distributors. The big combines saw in pasteurisation a great chance to oust the producer-retailer and to get the whole of the milk supply into their own hands. Dirty milk could not be made clean by pasteurisation. At Reading he had seen rats being fed on pasteurised milk and on raw milk. The experiment was not completed, but it had been found that they could not get rats fed on pasteurised milk to live beyond two generations, while rats fed on raw milk were living and breeding up to five and six generations.

Mr. Skelton, Parliamentary Under-Secretary for Scotland, replying to the debate, said that the argument that it would have been better to increase the consumption of liquid milk and to do nothing to prevent the decline of the cheese-making industry was one that had only to be

looked at to be rejected. There was real advantage also in substituting the home production of condensed milk for the foreign production. They need not postpone the development of the consumption of liquid milk on account of any fear that there would not be a sufficient supply of safe milk.

With regard to pasteurisation, all he would say was that if they could clean up the herds they would secure a degree of safety which could never be secured by pasteurisation, which had anxieties and dangers of its own. The experience of the Milk Board showed that the ascertainment of what were the proper costs of distribution was one of the most vital matters in connection with the milk scheme. There was an increasing realisation on the part of the Board, the producers, and consumers, and the distributors themselves, that the distributors must satisfy the nation a a whole that in the organ sed system which the milk scheme had produced they got their fair share, and no more than their fair share, of the costs and profits.

The resolution was carried by 177 votes to 43 —Government majority, 134.

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Lords and the Betting Bill

The Betting and Lotteries Bill is receiving a smooth passage through Committee in the House of Lords. Lord Hamilton of Dalzell's proposal that money from the totalisator fund might be applied to veterinary science and education was accepted.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

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DIARY OF EVENTS

June 11th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4.30 p.m.

June 11th.—D.V.S.M. Oral Examination begins.

June 15th.—Annual Dinner, Officers R.A.V.C., Hotel Victoria.

June 16th.—Meeting of the North of England Division, N.V.M.A., at Newcastle-on-Tyne.

June 20th.—Meeting of the Western Counties Division, N.V.M.A., at Plymouth.

June 27th.—Annual Summer Meeting of the Lancashire Division, N.V.M.A., at Southport.

July 2nd.—Membership Examination Fees due.

July 2nd.—N.V.M.A. Committee Meetings.

July 3rd.—N.V.M.A. Committee and **Council** Meetings.

July 4th.—R.C.V.S. Committee Meetings.

July 5th.—R.C.V.S. Committee Meetings.

July 6th.—R.C.V.S. Committee and **Council** Meetings.

July 9th.—Membership Written Examination.

July 11th.—Membership Oral Examinations begin.

July 30th-Aug. 3rd, 1934.—National Veterinary Medical Association Congress, Edinburgh.

Aug. 13th-18th, 1934.—Twelfth International Veterinary Congress, New York.

Aug. 24th.—Entries due for Jubilee Memorial Bursary Examination.

Sept. 24th-25th.—Examination for award of Jubilee Memorial Bursary.

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REPORTS OF CLINICAL CASES

It has been decided to offer payment to recorders of clinical articles published in *The Veterinary Record.*

It is suggested that, wherever possible, the adoption of a uniform method of recording cases is desirable, and the following is issued as a guide for the recording of clinical cases for publication.

Records should be as complete as possible, concise, and written in the third person. Photographs, radiographs, sketches and diagrams should be submitted if advantageous.

When describing lesions, dimensions should be indicated as far as possible by measurements, or by comparison with common objects.

SUBJECT.—**Age, sex and breed. In the case of cross-bred small animals—approximate bodyweight.**

HISTORY.—**Duration of disease. History of in-contacts. Nature of onset and course. Diet. Previous medical history.**

EXAMINATION.—**Eyes, ears, skin, mouth and teeth. Limbs and action. Thorax, abdomen, urinary and genital tracts. Examination of urine, fæces, discharges, skin scrapings.**

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

PROGNOSIS.

TREATMENT.—**In surgical cases details of anæsthesia and operation.**

COURSE OF DISEASE—OUTCOME.

POST-MORTEM EXAMINATION.—**Record should be comprehensive and findings carefully described.**

DISCUSSION.

Payment for published articles is at the rate of 10s. a column.

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PERSONAL

King's Birthday Honours.—The veterinary profession is represented in the list of honours conferred by His Majesty on the occasion of his 69th birthday by the name of William Henry Chase, Esq., *O.B.E.*, F.R.C.V.S. Mr. Chase, who is the Chief Veterinary and Agricultural Officer, Bechuanaland Protectorate, receives the C.B.E. in the Civil Division of the Order of the Britsh Empire.

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Birth.—On May 31st, at 59, Princess Road, Edgbaston, Birmingham, to Nellie, wife of C. G. Allen, M.R.C.V.S., a daughter.

R.C.V.S. COUNCIL ELECTION RESULT

The following result of the Royal College of Veterinary Surgeons' Council Election was announced at the Annual Meeting of the Royal College, held at 10, Red Lion Square, W.C.1, on Thursday last:—

Name.	Votes.
H. W. Dawes	824
J. C. Coleman	763
J. W. Brittlebank...	698
G. H. Livesey	692
G. K. Walker	647
A. Mackenzie	646
W. S. Mulvey	543
F. J. Taylor	527

(The above-named were elected.)

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J. T. Edwards	499
A. Spicer	488
D. S. Rabagliati	456
R. F. Wall	383
L. S. Balls...	372

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Irish Free State Veterinary Council Representation

It was also announced that the retiring representative of the Irish Free State, Mr. A. A. Donnelly, had been re-elected.

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R.C.V.S. OBITUARY

Bushman, George Augustus, 34, Florence Street, Islington, N.1. Graduated London, December 16th, 1890. Died May 30th, 1934; aged 69 years.

Mellon, Bagenal Harvey, Seaview, Greenisland, Co. Antrim. Graduated London, July 17th, 1909, Fellow July, 1914. Died January 13th, 1934.

Ridler, Francis Henry, 63, Palace Gardens Terrace, Kensington, W. Graduated London, April 21st, 1864. Died May 20th, 1934.

Sir Frederick Hobday's late Partner

Mr. F. H. Ridler, M.R.C.V.S., whose death we regret to record, was, prior to his retirement, associated in partnership for nearly 30 years with Sir Frederick Hobday, now Principal and Dean of the Royal Veterinary College.

"By the death of Mr. Ridler," says *The Kensington News*, "Kensington loses one of its oldest and most respected residents. Born in 1843, he decided early to follow the veterinary profession. After a brief period as an assistant in veterinary practice in Liverpool and other parts of England, he settled down in Kensington, where by his honesty of purpose and ability he soon gathered around him a large practice. One of his contemporaries at that time was the late Sir John Barker, who was then in the employ of Messrs. Whiteley, and it was one of Mr. Ridler's proud boasts when Mr. John Barker, as he then was, started the small shop in Kensington High Street, that he 'bought John Barker's first horse.' He and Sir John grew up together in a life-long friendship.

"It is a curious fact that the late Mr. Ridler's partner, Sir Frederick Hobday, assisted in the sale of the last horses of the firm of John Barker and Co. when they took entirely to motor vehicles, after the Great War.

"Mr. Ridler was known among his friends and those who had professional business dealings with him as one of the straightest of men, and his word over the suitability for purchase of a valuable animal, whether horse or dog, was never disputed. Of a genial disposition and tactful manner, he was popular alike with every class of client, and his 'passing' is to be noted as that of one whose long life was a link between the Kensington of the past, and the Kensington of the present day.

"The funeral took place at Kensington Cemetery, following a service at Denbigh Road Wesleyan Church, Bayswater. It was Mr. Ridler's special wish that he should be carried to his grave behind horses."

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ROYAL SOCIETY OF MEDICINE: COMPARATIVE SECTION

A valuable discussion on "Corynebacterium infections, with special reference to Caceous Lymphadenitis of Sheep" took place at the Annual General Meeting of the Section of Comparative Medicine of the Royal Society of Medicine on the 23rd ultimo. The discussion was opened by Professor Buxton and Dr. Carne, other participants being Mrs. Barratt and Dr. Ledingham, of the Lister Institute, Dr. J. T. Edwards, Dr. Minett and Professor Wooldridge. Particular interest attached to the observations of Mrs. Barratt concerning the isolation from human throats of aberrant strains of the Corynebacterium group, intermediate between the diphtheria and the Preisz-Nocard bacillus. We look forward to publishing an extended abstract of the discussion in a future issue.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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THE ROYAL INSTITUTE OF PUBLIC HEALTH

To the Editor of The Veterinary Record.

Sir,—I beg to draw your attention to an inaccuracy under the above heading in to-day's issue of *The Veterinary Record*.

In my address I did not urge the need for a State Veterinary Service. In advocating the unification of control of animal diseases and of the milk and meat supply, I gave two alternatives whereby this desirable object might be attained. The first was a State Service and the second an improved local service. In the latter case, I proposed that the powers already held by non-county boroughs, urban and rural districts should be transferred to the County Councils, and in order to obtain uniformity in the various counties, greater powers of supervision should be given to the Ministry of Agriculture.

As there is much to be said for both alternatives, I left it to my audience to form their own opinions.

Yours faithfully,
W. T. MacGregor.

County Council of the West
Riding of Yorkshire,
Veterinary Department,
County Hall,
Wakefield.

June 4th, 1934.